

Vol. IV

TRANSCRIPT OF RECORD

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Supreme Court of the United States

OCTOBER TERM, 1944

No. 296

PANHANDLE EASTERN PIPE LINE COMPANY,
ILLINOIS NATURAL GAS COMPANY AND MICHIGAN
GAS TRANSMISSION CORPORATION, PETITIONERS.

vs.

FEDERAL POWER COMMISSION, CITY OF DETROIT,
COUNTY OF WAYNE, MICHIGAN, ET AL.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE EIGHTH CIRCUIT

PETITION FOR CERTIORARI FILED JULY 28, 1944.

CERTIORARI GRANTED JANUARY 3, 1945.

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United States Circuit Court of Appeals
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No. 12,466

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FILED FEBRUARY 6, 1943.

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The first well in Oklahoma to be connected is the Arnold, and the line will start at that well, which is near the center of the west half of Section 31, Township 4, Range 17, and it extends to a point in the southwest quarter of Section 30, Township 4, Range 17, Texas County, Oklahoma.

[fol. 4960] It is a 4-inch line, .68 of one mile in length.

The next well is the Banta. The line will start near the center of the south half of the northeast quarter of Section 8, Township 3, Range 16, and will extend to a point near the center of the south half of Section 9, Township 3, Range 16, Texas County, Oklahoma.

It will be a 4-inch I. D. line, .83 of one mile in length.

The next well is the Bartels. The line will start near the center of the northwest one-quarter, Section 30, Township 4, Range 15, and will extend to a point near the center of the northwest quarter of Section 30, Township 4, Range 15, Texas County, Oklahoma. It is a 4-inch I. D. line and .05 of one mile in length.

The next is the Bateman. The line will start near the center of the northwest quarter of Section 8, Township 5, Range 17, and will extend to a point in the southwest quarter of Section 9, Township 5, Range 17, Texas County, Oklahoma. It is a 4-inch I. D. line, 1.20 miles in length.

The next is the Findley. It will start near the center of the north half of Section 16, Township 5, Range 13, and will extend to a point near the northeast quarter of Section 20, Township 5, Range 13, Texas County, Oklahoma. It is a 4-inch I. D. line, 1.38 miles in length.

The next will be the Hammond. The line starts near the center of the east half of Section 19, Township 3, Range 16, [fol. 4961] and extends to a point in the southwest quarter of Section 20, Township 3, Range 16, Texas County, Oklahoma. It is a 4-inch I. D. line, .60 of one mile in length.

The next is the Hoeme. That line will start at a point which is approximately 100 feet west of the center of the east line of Section 9, Township 4, Range 17, and will ex-

tend to a point in the northeast quarter of Section 9, Township 4, Range 17, Texas County, Oklahoma. It is a 4-inch I. D. line, .20 of one mile in length.

The next is the Howell. It starts near the center of the west half of Section 32, Township 5, Range 15, and extends to a point in the southeast quarter of Section 32, Township 5, Range 15, Texas County, Oklahoma. It is a 4-inch I. D. line which is .20 of one mile in length.

The next is the Olsen. It starts near the center of the south half of Section 9, Township 2, Range 16, and extends to a point near the center of Section 11, Township 2, Range 16, Texas County, Oklahoma. It is a 4-inch I. D. line, 2.05 miles in length.

The next is the Peerless Oil Company, and the line will start near the center of the north half of Section 23, Township 3, Range 16, and will extend to a point in the northwest quarter of Section 23, Township 3, Range 16, Texas County. It is a 4-inch I. D. line which is .50 of one mile in length.

That is the total of the 10 wells to be connected in the [fol. 4962] State of Oklahoma portion of the Hugoton Field, a total of 7.69 miles.

In Kansas, the first well to be connected on this line is the Berg. The line will start near the center of Section 15, Township 33, Range 34, and extends to a point near the center of the north half of Section 22, Township 33, Range 34, Seward County, Kansas. It is a 4-inch I. D. line, .56 of one mile in length.

The next is the Huxman. The line starts near the center of Section 4, Township 30, Range 34, and extends to a point near the northwest corner of Section 28, Township 30, Range 34, Haskell County, Kansas. It is a 4-inch I. D. line that is 1.80 miles in length.

The next is the Leigh. The line starts near the center of the east half of Section 27, Township 28, Range 38, and extends to a point near the center of Section 25, Township 28, Range 38, Grant County, Kansas. It is a 4-inch I. D. line, 1.70 miles in length.

The next is the Miller. The line will start at a point located in the southwest one-quarter of Section 1, Town-

ship 29, Range 35, and will extend to a point in the northwest quarter of Section 17, Township 29, Range 34, Grant County, Kansas. It is a 4-inch I. D. line, which is 2.34 miles in length.

The next is the Newby. That line starts at a point near the center of the east half of Section 28, Township 31, [fol. 4963] Range 37, and extends to a point in the northeast one-quarter of Section 27, Township 31, Range 37, Stevens County, Kansas. It is a 4-inch I. D. line which is one mile in length.

The next is the Pettijohn. This line starts at a point near the center of Section 14, Township 31, Range 39 West, and extends to a point in the northwest one-quarter of Section 14, Township 31, Range 39, Stevens County, Kansas. It is a 4-inch I. D. line which is .38 of one mile in length.

Another Pettijohn well, from which the connecting line will start at a point near the center of Section 15, Township 31, Range 39, and extend to a point near the center of Section 15, Township 31, Range 39, Stevens County, Kansas. It is a 4-inch I. D. line, which is .1 of a mile in length.

The next is the Prichard. The connecting line will start at a point near the center of Section 22, Township 31, Range 39, and extend to a point near the center of Section 15-31-39, Stevens County, Kansas. It is a 4-inch I. D. line, which will be one mile in length.

The next is the Sullivan. The connecting line will start at a point which is near the center of the south one-half of Section 5, Township 29, Range 37, and will extend to a point in the northeast quarter of Section 32, Township 29, Range 37, Grant County, Kansas. It is a 4-inch I. D. line, which will be 1.47 miles in length.

The next is the Williams. This line will start near the [fol. 4964] center of Section 32, Township 27, Range 37, and will extend to a point in the southeast one-quarter of Section 33, Township 27, Range 37, Grant County, Kansas. It is a 4-inch I. D. line, which will be .68 of one mile in length.

The total length for the 10 wells located in the Kansas portion of the Hugoton Field will be 12.03 miles.

Q. The next item concerning which I would like to inquire, which appears on Page 31 of Exhibit 42, is Item "h", "Construct additional required gathering lines in the Hugoton Field, costing \$149,291."

Will you describe these lines, giving the sizes of pipe and the length of pipe and the location?

A. Yes, sir. The Oklahoma gathering lines are described as follows:

The Arnold gathering line will start at a point in the northwest quarter of Section 26, Township 4, Range 16, Texas County, Oklahoma, and extend to a point in the southwest quarter of Section 30, Township 4, Range 17, Texas County, Oklahoma. It is a 6-inch I. D. line, 1.8 miles in length.

Q. With what line will that connect?

A. That will connect to the general gathering system in Oklahoma. If you would like it more fully described, I can show you on the map.

Q. I think it would be best for you to point to the map in describing these facilities.

[fol. 4965]. A. The line just described, which will be called the Arnold gathering line, connects to the 16-inch line which extends in a northeasterly direction from the converging point of the Oklahoma gathering system, and to the east the Arnold well will be connected into this line, which will be drilled during the year 1946.

Q. And that is shown colored in blue on the map, Exhibit No. 46?

A. That is correct.

Q. To which you have just referred?

A. Yes, sir.

The Bartle gathering line will start near the center of the west line of Section 18, Township 4, Range 15, Texas County, Oklahoma, and will extend in a southwesterly direction to a point in the northwest quarter of Section 30, Township 4, Range 15, all in Texas County, Oklahoma.

It will be a 6-inch I. D. line, which will be 1.9 miles in length.

The next line will be known as the Tyrone. Now, we will call this the Tyrone line, because it extends up north to

the vicinity of the Town of Tyrone, and in the laying out and naming of the gathering lines, why, it is well to have some name that everyone understands and can identify that line by, because we don't remember the numbers so well that are on the map as we do the names.

[fol. 4966] The Tyrone line will start at a point in the northeast quarter of Section 12-4-16 and will extend in a northeasterly direction to a point in the southwest quarter of Section 9, Township 5, Range 17, Texas County, Oklahoma. This will be a 6-inch line, which will be 6.3 miles in length.

The connection on the southern end to the 16-inch line, which is really an extension in the same direction of the 16-inch line that runs northeasterly from the central point of the gathering system at Oklahoma—

Q. (Interposing) And which was one that you described as being one of the capital additions to the gathering lines in 1942?

A. In 1942, yes, sir, shown in brown. The line that it connects to is shown in brown, and the line just described is shown in blue.

Q. Now, are there any other gathering lines included in Item "h" on Page 31?

A. Not in the State of Oklahoma, but in Kansas we do build some gathering lines.

The first line will be called the Pettijohn gathering line because it will be built primarily to pick up the Pettijohn acreage or production from the Pettijohn acreage, and it will start at a point in the northeast quarter of Section 4, Township 31, Range 38, Stevens County, Kansas, and extend in a southwesterly direction to a point near the center [fol. 4967] of Section 15, Township 31, Range 39, Stevens County, Kansas. This will be a 10-inch I. D. line, which will be 5.3 miles in length.

The next extension which will be built will be an extension to the Ulysses extension, and the line will start in the northwest quarter of Section 32, Township 28, Range 37, Grant County, Kansas, and will extend to a point near the center of the east half of Section 25, Township 28, Range 38, Grant County, Kansas. That will be an 8-inch line, 1.7 miles in length.

The next line will be known as the Williams gathering line. It will start at a point in the southeast quarter of Section 21, Township 28, Range 37, Grant County, Kansas, and will extend to a point near the northeast corner of Section 33, Township 27, Range 37, Grant County, Kansas. This will be an 8-inch line, which will be 4.5 miles in length.

Q. To what line does that connect?

A. The Williams gathering line will connect on the south to the extension of what is known as the Grant County, 18-inch line. The Grant County 18-inch line—that might be a misnomer, because it is only an 18-inch line from the Liberal intake side of the Liberal compressor station up to a point where a line joins it in the northwest quarter of Section 28, Township 30, Range 34, and then it reduces to a 16, and continues in a northwesterly direction to a point in about the northeast corner of Section 24, Township 29, Range 36.

[fol. 4968] It then reduces in size to a 12-inch line for the next, approximately, 4 miles, and then the extension is a 10-inch line, and that is where the Williams line will connect to the present system on that 10-inch line.

Q. Now, have you described all of the gathering lines that are included within Item "h" on Page 31, Exhibit 42?

A. Yes, that is all.

Q. Mr. Hinton, you have an Item "i" on Page 31, "Construct new compressor station near Town of Hugoton, serving areas west of Hugoton at cost of \$362,398," and an Item "j," entitled—

A. (Interposing) Pardon me. I am inclined to think that we have a direction mixed up there. We don't serve areas west of Hugoton from that compressor. It should be east.

Q. Then a correction should be entered?

A. Yes. That is on Page 31, Exhibit 42, under Item "i."

Q. In the second line the word "west" should be changed to "east"?

Mr. Wheat: That is the first, "i" appearing on the page?

The Witness: It is questionable there. What that compressor is for is to take care of lowering the pressures west of the station, but the gas will travel to the east, and I thought that that might be clarified a little bit there by showing that the gas will not travel to the west.

[fol. 4969] Mr. Wheat: That is the Item "i" under 1946, is it not?

The Witness: Yes, sir.

Mr. Wheat: The second "i" item which appears on Page 31?

The Witness: That is correct.

By Mr. Littman:

Q. Are you suggesting that the word "west" be changed to "east" on that line?

A. I just brought it up for clarification there.

Mr. Culton: Suppose you point out on the map the areas that will be served around the Town of Hugoton, so that it will be clear.

The Witness: The blue triangle here (indicating) shows the proposed location of this compressor station and, probably, the reason that I said it was to serve areas west of there is because I was thinking that it would take care of these wells (indicating), but inasmuch as there is distribution and transportation in this case, why, it might lead somebody to believe that that gas is going to travel to the west instead of the east.

Mr. Culton: I think your word is all right, if that is the situation, because it does serve the wells that lie west of Hugoton.

The Witness: That is right. I just thought perhaps it should be clarified.

Mr. Culton: I think the language is all right.

[fol. 4970] The Witness: I am not sure but what I interrupted your question there.

By Mr. Littman:

Q. I was then going to ask you to describe those facilities and, also, the facilities embraced by the next item,

"j," "Construct dehydration plant in connection with new compressor station, costing \$70,000."

A. All right, sir.

By 1946, it is going to be necessary, in my opinion, to install horsepower to maintain the desired load through that portion of the Hugoton system and, in order to be able to take the amount of gas from that section of Hugoton Field which we would want to take, it will be necessary to install 2600 horsepower and, of course, as soon as that pressure is boosted to a point which is above the critical freeze point in that field, it will be necessary to install a dehydration plant.

The dehydration plant will be built in conjunction with the proposed compressor station.

Mr. Culton: By the way, may I interject this question:

Do you find any difference on the freeze point in the Hugoton Field from that which exists in the Panhandle Field?

The Witness: Yes, there is some difference, and there is considerable difference in various portions of the Hugoton Field as to the type of freeze which we encounter.

Mr. Culton: In other words, there is a greater likelihood of freeze, even at the same temperature, in the Hugoton Field than there is in the Panhandle Field?

The Witness: Apparently, that is the case, because that is what we have experienced.

Mr. Culton: Do you know why that is?

The Witness: No, I do not.

Mr. Culton: Does there happen to be any difference in the chemical constituents of the gas?

The Witness: Oh, yes. The heat values of the two gases are different and the gasoline recovery is different in the two fields.

Mr. Culton: Do you suppose those differences might have some effect on the difference of the freeze point?

The Witness: Yes, I would say that they do.

Mr. Lee: What is the difference in the heat value?

The Witness: Why, in the Panhandle Field, our range of heat value is from about 1060 to—I don't believe we have any lower than 1020 in that field. That is 30 inches saturated.

Mr. Lee: That is B. t. u.'s per thousand cubic feet?

The Witness: Yes.

Mr. Lee: What did you say, 1020 to 1050 in the Panhandle?

The Witness: 1060. Those figures are approximate.

Mr. McRee: That isn't per thousand, is it? It is per cubic foot, isn't it?

The Witness: Per cubic foot.

[fol. 4972] Mr. Lee: When you speak of that 1020, you speak of it in the hundred-thousands, don't you?

The Witness: No, that is per cubic foot.

Mr. Lee: Yes, that is right.

Trial Examiner: There is an atmospheric pressure there, a density factor?

The Witness: Yes, that is 30 inches saturated, and in the Hugoton Field the highest that I can recall is 1034. The lowest is just below 990, that is on the same 30 inches saturated.

Mr. Lee: Are you familiar with the fact that what is actually delivered to the customer in Detroit varies, approximately, between 990 and 1010?

The Witness: I know there is usually a variation there of about 15 B.t.u.'s, and I don't recall it being down as low as 990.

It usually runs from about 1004 to 1014, in that range there. There might be a few days that it would get down that low, but not many.

Trial Examiner: That is on the same density factor, is it, Mr. Lee?

Mr. Lee: Well, I presume so, your Honor.

The Witness: That is the 14.73. That is the reason we have gone to 30 inches saturated, for comparison. We formerly took those on a 2-pound pressure base, and then we took quite a few heat-value tests on 14.65-pounds pressure base, and then we have started testing to 14.73, be- [fol. 4973] cause our calorimeters are set to 14.73.

We are establishing heat values by calorimeter tests now, rather than by fractional analyses which we formerly used.

Mr. Culton: That is all I had on that, Mr. Littman. I just thought it might be advisable to bring up the fact that there is a slight difference in the freeze point in the two areas.

By Mr. Littman:

Q. Have you been able to locate your working papers that show the details of the capital additions for the years 1942 and 1944?

A. Yes, sir.

Q. Do you have them with you?

A. No, they are in the air mail from Kansas City right now, and they were not lost at the office of the Federal Power Commission at all, but the loss was due to my method of filing, I believe.

Mr. Culton: We have already discussed that method of filing.

By Mr. Littman:

Q. Do you expect them sometime today?

A. I thought that they would be in this morning, but I think that they have an extremely heavy incoming mail into the hotel, and I would imagine that they are there but have not been sorted yet.

[fol. 4974] Q. Well, we can discuss further the years 1942 and 1944 after your working papers arrive.

Mr. Hinton, you made certain assumptions, did you not, with respect to the suction pressures at the various main compressor stations, including Liberal compressor and the stations south and west of Liberal. Is that correct?

A. Yes, I believe you call that an assumption.

Q. Well, you had to use certain figures? A. Yes.

Q. Now, those compressor stations are at Liberal, Sneed, Hansford and Hugoton, are they not?

A. The proposed station at Hugoton.

Q. Now, those suction pressure figures were used in connection with arriving at the figures shown in Exhibit 43, Schedule 5 of Exhibit 43?

A. Yes. They did govern this amount.

Q. Will you state what figures you used for each of those compressor stations, year by year, for the entire period under, first, the basic load and, second, under the anticipated load?

Mr. Culton: Is that suction pressure?

Mr. Littman: Yes. And by "period", I mean through the year 1956.

Mr. Culton: I wonder, so that the record might be clear, [fol. 4975] if we might have him explain just what is meant by suction pressure, since the word is really a misnomer from an actual standpoint.

It is apparently used, but just what do you mean by the words "suction pressure"?

The Witness: The pressure in the pipe line at the intake side of the compressor station.

The Sneed suction pressures for the years 1942 to the year 1957 are estimated to be as follows—

By Mr. Littman:

Q. (Interposing) Now, are these under the basic load, or are these under the anticipated load?

A. These are under the anticipated load, and I don't believe that I carried the basic load pressures on down there, but they can be read from the curves because, as the field pressure declines, then the intake pressure at the Sneed station will be governed by the decline of the field pressure.

Mr. Culton: That intake pressure is what is ordinarily referred to as suction pressure of the station?

The Witness: That is right.

By Mr. Littman:

Q. What is the number of the folder of the working papers that you have before you?

A. No. 11, group area, rock pressure summary, Texas.

Q. What is the number? A. 11.

[fol. 4976] Q. File No. 11?

A. Yes. I have two pressures for Sneed, because we will be dividing the header at Sneed as soon as we install the two additional engines, and by dividing the header, I mean that, on the intake side of the compressor station it is necessary that a pipe be laid parallel to the horizontal length of the compressor station in order that each engine and compressor may have piping removed for an intake and a discharge piping system.

As soon as we install the two additional engines at the Sneed station, there will be a Merco-Nordstrom gate placed in this header, which will enable the station to operate at different pressures from the line, the present 18-inch line and the present 20-inch line.

Do you have the idea now of what will happen?

Q. Yes.

A. So that, for that reason, we have these two Sneed suction pressures.

Now, they are the same for a—

Q. (Interposing) Do you have two trunk gathering lines there?

A. Well, we will have before these engines are installed. The looping was described in "1942, Capital Expenditures", and there will be two lines coming into the station.

[fol. 4977] Q. Now, you are going to read the intake pressures at Sneed compressor station for the years under the anticipated load requirements?

A. Yes.

Q. Now, the first one is for what pipe line?

A. The first will be for the pipe line serving areas "A", "B" and "C".

Q. Which areas are shown on the map, Exhibit No. 46. Is that an 18-inch line running southeast from Liberal compressor station from Sneed?

A. From the Windmill Junction, which is just south of the Sneed station.

Then, this 18-inch line runs in a southeasterly direction to a point just south of the old town site of Deahl, Texas.

Q. Very well. Do you wish to read the figures?

A. For the year 1942, we estimate that we can carry a Sneed intake pressure of 293 pounds.

Year	Pressure, pounds.
1943	285
1944	273
1945	261
1946	247
1947	231
1948	216
1949	208
[fol. 4978] 1950	190
1951	172
1952	154
1953	136
1954	118
1955	100
1956	80
1957	60

For the group areas "D", "E", "F" and "G", the estimated pressures at the intake of Sneed compressor station will be as follows:

Years	Pressures, pounds.
1942	293
1943	288
1944	276
1945	261
1946	246
1947	228
1948	210
1949	210
1950	192
1951	174
1952	154
1953	134
[fol. 4979] 1954	114
1955	90
1956	70
1957	50

Mr. Lee: Mr. Witness, are those estimated declines inevitable, or may there be conditions that will result in very little decline over that period of years, as far as pressures are concerned?

The Witness: It could be possible that there would be no decline at all, if everyone would stop taking gas from the field right now.

Mr. Lee: Well, but are there mechanical conditions that can reduce the decline?

The Witness: Not the formation decline.

Mr. Lee: Well, can they reduce the decline so far as getting out the reserves is concerned?

The Witness: Do you mean as far as furnishing these pressures that have been set up for the intake side of the Sneed station?

Mr. Lee: Increasing them, yes.

The Witness: Yes, by spending many thousands of dollars, it would probably be possible to come into this station at a higher pressure by installing horsepower on a decentralized system throughout the entire field.

[fol. 4980] Mr. Lee: Well, you have discussed something about that.

The Witness: Yes.

Mr. Lee: Just one other question—pardon me for breaking in on you there—while you are talking about the decline, is that on the assumption that the decline is throughout the entire area with the present number of wells, or with the prospective number of wells?

The Witness: With the prospective number of wells and the prospective development by others, and an estimate that is based on what is believed will be approximately the amount of gas which will be withdrawn, year by year, from the Padhandle Field.

Mr. Lee: Does it take into contemplation any possible increase in your acreage?

The Witness: No.

Mr. Lee: It is predicated upon the present acreage.

The Witness: But the acreage is not the controlling factor in the life of the Panhandle Field at all. It is the rate of withdrawal.

Mr. Lee: Yes, I understand, but if you went out and acquired 10,000 more acres, virgin acres that may have great gas reserves, that would make a change, wouldn't it?

The Witness: Not particularly, no, not as long as we are operating under the present conditions, because if we went out and added 10,000 acres to our present holdings in the Panhandle Field, it would mean that we would be [fol. 4981] taking a smaller amount of gas from each well, but the same total amount would be taken from the field.

That would mean that other companies would be pulling heavier from adjoining acreage, therefore, the addition of 10,000 acres to our present acreage would have very little influence on the total length of life or the total term in which we could operate in the Panhandle Field.

By Mr. Littman:

Q. Now, Mr. Hinton, will you please state the intake pressures for the Hansford pressure station, first, under the anticipated load?

A. That will be rather easy, because for about the next ten or twelve years, that intake pressure will be 300 pounds, and it will drop off from 300 pounds after that, in the proportion that the Sneed discharge pressure will force it to drop off.

Mr. Culton: Explain that. Does the Sneed pressure control that pressure?

The Witness: Yes, as the intake pressure of the Sneed station declines, it is necessary to maintain the same discharge pressure out of that station, which changes the ratio of compression and means that more horsepower is required to compress the same amount of gas.

Mr. Culton: That is, at the same discharge?

[fol. 4982] The Witness: Yes, at the same discharge.

Now then, the Hansford station is a station that is powered with 650 horsepower units, and in order to get good

efficiency from those engines, it is necessary to hold about the same ratio of compression at all times.

Therefore, we are installing additional horsepower at Sneed so that we can maintain the 300-pound intake pressure at Hansford station, because that will result in the greatest efficiency from the horsepower which we will install.

Mr. Culton: In other words, the intake at the Hansford station is controlled by the output at the Sneed station?

The Witness: That is correct.

By Mr. Littman:

Q. What would you expect the intake pressure at Hansford compressor station by 1956 to be?

A. By 1956, in all probability, there will be additional horsepower installed between the two stations, because at that time we will be using the Sneed station as a two-stage station and will be handling less gas.

Of course, we will not have the pressure drop in the line, because the volume will be down, but, at the same time, we will be starting out of Sneed at a lower discharge pressure, because it will no longer be possible for the six units, which we feel will be the total horsepower installed at Sneed, to pass or compress enough gas to get the gas into Hansford.

[fol. 4983] Therefore, it is anticipated that adjustments will have to be on that line in the form of additional horsepower further up the line; that will be a small unit, probably a rotary blower type of compressor that will take care of that problem as it comes up, and we will still try to hold 300-pound intake at the Hansford station.

Q. Through 1956?

A. Yes.

Q. Can you give us the pressures for the Hansford station under the basic load?

A. It will be the same. That station is designed for a 300-pound to get into Liberal at the proper pressure.

Q. Now, will you state the pressures for the Hugoton station which, according to your testimony, is expected to be constructed in 1946?

A. I have not established a definite pressure for Hugoton Field, because the withdrawal to date has been very low. I mean the total withdrawal from the field.

There is only some 250 or 260 billion cubic feet of total withdrawal, but the past year we experienced a rather sharp pressure decline in that field, and that is the first year that there has been anything like an even heavy withdrawal.

It has been running around somewhere 100 million cubic feet a day withdrawal.

The pressure decline average for the field was between [fol. 4984] six and seven pounds for the past year. It does not take an extremely low pressure in the Hugoton Field to require additional horsepower, because those wells are forced to work at a lower pressure, and I believe that we can get along until 1946 without horsepower, but I am not sure.

However, I know that we will put it off as long as we possibly can, but I feel sure that we will need horsepower in that year.

Q. Well, I ask you for the suction pressures that you would expect to use in 1946 and thereafter for the Hugoton compressor station or, perhaps, I had better say, what suction pressures you did use in arriving at the figures shown in Schedule 5?

A. What suction pressures?

Q. I beg your pardon. Withdraw that. Perhaps I can state it more clearly.

I asked you to state the intake pressures for the Hugoton station, which you used in arriving at your production as to the Hugoton Field.

A. 310 pounds gage.

Q. For 1946?

A. Yes.

Q. What about the other years down to 1956?

A. I do not make any attempt to go down through those years. Here we have a field with an estimated reserve [fol. 4985] of, well, all the way from 6 trillion to 13 trillion, the estimates of various geologists, I believe.

There has been a total of 250 billion feet withdrawn, and anybody that would try to go down through a field that has had no greater withdrawal than that would certainly be sticking his neck out.

Q. Well, I take it that you didn't use any specific intake pressure for purposes of making your estimates with respect to the Hugoton station?

A. Yes, we know that we would use 310 pounds there, because that would get us below our freezing trouble, and if we had horsepower, we know that we would go at least that low, because we would have to install sufficient horsepower to give us a ratio of compression where it would be possible to work with that low intake pressure.

Mr. Culton: You didn't determine or ascertain the capital expenditures for that later period of the life?

The Witness: No, sir.

By Mr. Littman:

Q. The thing I would like to know is whether you used the 300-pound pressure figure?

A. 310.

Q. I thought you said 300.

A. If I did, I should have said—

Mr. Culton: (Interposing) 310 gage is what he said.

[fol. 4986] Suppose he explains what he means by "gage."

The Witness: That is just the pressure that we read by gage without adding anything for the atmospheric pressure.

By Mr. Littman:

Q. Did you use that pressure for the Hugoton compressor station for the year 1946 and subsequent years in arriving at your estimate of production?

A. I feel reasonably sure that we can still maintain 310-pound intake pressure at the side of the proposed Hugoton station in 1946, because we will have looped, by that time, a few of the bottle necks in the present system, and the fact that we have installed horsepower is not due to the inability of the wells to produce a certain amount of gas, but it is because we want to transport a greater

quantity of gas through the present 16-inch line to augment the peak-day requirement into Liberal station.

Q. How much decline do you expect by 1956?

A. 1956?

Q. Yes.

A. In what field?

Q. In the Hugoton Field.

A. I wouldn't say.

Q. At the intake of the Hugoton compressor station?

A. If you will tell me what the rate of withdrawal from the Hugoton Field will be, I will give you that figure.

[fol. 4987] Q. Well, I cannot tell you that, of course.

A. And I don't believe anybody else can, therefore, it would be impossible to make an estimate.

Q. What pressure did you use for the intake side of the Hugoton compressor station for 1947?

A. I didn't use it, I didn't go beyond 1946.

Q. Now, what intake pressures did you use for the Liberal compressor station?

A. I am not sure that I can tell you all of those, because those were worked out—Mr. Burnham can tell you when he comes—but they tell us what our discharge has to be, and we do not tell them what their suction has to be.

Q. Do you understand? That is where the main line takes over, at the Liberal station, and they tell us at what pressure we must come into that station.

I am not sure that I can remember all of those, Mr. Littman.

Q. Will you state the pressures at which the field lines come into Liberal compressor station?

A. At this time?

Q. Yes.

A. There is a minimum of 225 pounds. That is a minimum order and the maximum is 385 for the past year.

Q. Well, now, what pressures did you assume for purposes of your study?

[fol. 4988] A. Pressures between 275 and 300 pounds.

Q. For all the field lines?

A. No.

Q. For what field lines?

A. For the Kansas lines on the intake side of Liberal station. The Texas line runs slightly lower than that.

Q. What figure?

A. I believe that we would find that that would average between 250 and 260.

Q. There is more than one Texas line going into Liberal, is there not?

A. Not at this time.

Q. But you expect there will be more than one, inasmuch as you are building some additional facilities?

A. Yes.

Q. Under your anticipated load?

A. That is correct.

Q. What pressures did you assume for those lines?

A. Approximately the same pressures, because as those lines are built, they will be required to transport the same proportional amount of gas that the present system will carry.

Therefore, the ratio of compression to the Sneed station will remain practically as it is, and the incoming pressure or the intake pressure at Liberal station will be approximately the same. That is governed by volume rather than [fol. 4989] design of new lines.

Q. Now, what would you say with respect to the Oklahoma gas coming into the Liberal compressor station?

A. We had hoped to get a production of $1\frac{1}{2}$ million feet-per-well average and come into the Liberal station at a suction pressure of between 250 and 260 pounds.

That, again, is rather difficult to make an estimate of, because we have no wells in there at this time, and, as you know, we are just completing our first well.

Q. Well now, is that a separate line?

A. Yes, that is a separate line.

Q. Well, have you made any estimate for these various lines for the various years from 1942 down to 1956?

A. Not calculating an estimate, but just going on knowledge. It is one of those things that you know is reasonably close to right, and if you spent six months trying to calculate it, you might not be any closer to being right than just your first instinct of it, carrying on of experience.

Q. Do you have any idea of what the pressures would be in 1956?

A. Where?

Q. At Liberal, for the Kansas line.

A. Oh, by 1956 we will, in all probability, be coming into the intake side of the Kansas station at approximately the same intake pressure as we are using at this time.

[fol. 4990] Trial Examiner: You mean the Liberal station?

The Witness: The Liberal, because by 1956 it is going to be necessary to install many, many more horsepower in that field to come into Liberal station.

Mr. Culton: You mean individual compressors?

The Witness: I mean there will be field compressors of several thousand horsepower each. The reason that this problem will be cared for in this way is because, at the present time, the Liberal station is so designed,—water piping, the headers and the general piping layout of the station,—in such manner that it would be almost an impossibility to add the additional required horsepower to take care of the pressure decline at that point.

Therefore, it is assumed that it will be taken care of at points in the field system.

[fol. 4991] By Mr. Littman:

Q. Mr. Hinton, you assumed and used certain average well head working pressures in making your estimate for each group, "A" to "G", inclusive, in the Texas Field, did you not? A. Yes, sir.

Q. And that was for each of the years 1942 through 1956? A. That is correct.

Q. Now, there are a good many of such figures, are there not?

A. Yes, there are several.

Q. In order to save time, will you please submit to me a typewritten copy of those average well head working pressures for each of the areas?

A. Yes, if you so desire.

Q. I would prefer it in a statement form and then perhaps we can make it an exhibit and get it in the record in that manner, rather than to take the time to read it into the record.

A. Of course, all of those pressures are in my working papers, but if you prefer to have them typed, why, that can be done. I am sure there is a stenographer available around Washington somewhere.

Q. We would appreciate a statement of those well head pressures.

Mr. Culton: Mr. Littman, I am wondering—that, of course, would be rather lengthy, and I believe there is [fol. 4992] another exhibit we plan to make—I am wondering if there is any possibility that that can be postponed until Saturday, the making of those exhibits, do it Saturday?

Mr. Littman: You mean, you can submit the statement on Saturday?

Mr. Culton: No, I mean wait until that time to prepare it, because I anticipate, during this hearing, the witness won't have much time to do that.

Mr. Littman: That would be satisfactory.

The Witness: It will mean that I will have to go through these detailed sheets and copy all of those pressures on one sheet to get it in exhibit form and, of course, that will take some time.

Mr. Littman: Well, I would certainly be satisfied if we could get them by Saturday.

Mr. Culton: What I had in mind was, he probably would not be able to do it before Saturday, use Saturday for it.

Trial Examiner: I understand you are about to introduce another subject for cross examination?

Mr. Littman: Yes.

Trial Examiner: Before Mr. Hinton leaves this subject, I will ask him to refer to the rock pressure map of 1940, which is exhibit 26 for identification, and I would like to ask whether the heavy, straight lines marking the southerly boundary of the pressure area as defined on this map are [fol. 4993] arbitrary lines, or do they mark the actual partial boundaries to the south or southwest of that known gas production area?

The Witness: The line referred to, the heavy outline line, is an actual line. It might perhaps be misleading, due to the fact that two parts of the southerly boundary of the field are straight lines.

Those straight lines in the outline boundary show where there exists a known fault, and over to the southwestern part of the Panhandle Field, the fault line is the southern line of the Panhandle Field and, also, the approximate northern line of the known helium field which is used to furnish gas to the helium plant owned by the United States Government, located west of Amarillo.

Trial Examiner: The line to which you refer is the diagonal line in Potter County north of Canadian River?

The Witness: That is correct.

Trial Examiner: And the line in Carson County, which is also a long straight line, I understand also represents a definite fault?

The Witness: It does represent a definite fault that has been established and located by actual drilling.

Trial Examiner: Thank you.

Mr. Culton: It might be a good idea to state, for the purpose of the record, a fault represents a place where there has been a slippage of the earth so that formations [Col. 4994] which at one time were continuous are now found at one elevation on one side of the fault line, and at another elevation at the other side of the fault line.

The Witness: That is right. A fault is established by the difference in elevations of like formations within a short space.

Mr. Littman: If your Honor, please, I would like to have marked for identification with the next exhibit number, a table entitled, "Future Division of Production Between Fields Considering a Reasonable Expected Load Increase."

Trial Examiner: This will be marked for identification as Exhibit No. 131.

(Exhibit No. 131 was marked for identification.)

Mr. Littman: I would also like to have marked for identification as Exhibit No. 132, a table entitled, "Future Division of Production Between Fields without Consideration for Increased Loads, Pressure Base 16.4 Pounds."

Trial Examiner: This will be marked for identification as Exhibit No. 132.

(Exhibit No. 132 was marked for identification.)

By Mr. Littman:

Q. Mr. Hinton, Exhibits Nos. 131 and 132 were supplied by you in pursuance of my request of the day before yesterday, were they not? A. They were.

[fol. 4995] Q. And they contain data copied from your working papers?

A. Yes. I would like to explain the asterisk which appears for the year 1946 on the West Panhandle Field on Exhibit No. 131 should not be there.

Neither should the footnote on this exhibit be there, the reason being that you will note that the footnote says, "Beginning this year it is assumed that the J. M. Huber Corporation and Northern Natural Gas Company purchase contracts will be relinquished."

Now, that footnote was copied over by my clerk and should not appear on this. For the purpose of establishing a value for gas purchase contracts, those two contracts were eliminated, but I felt reasonably sure there was a chance that those contracts would be renewed and have carried them down as still being connected to our line in these figures, although they were taken out of the gas purchase contract evaluation.

Mr. Culton: You are referring to Mr. Biddison's testimony in that. You furnished figures to him and he eliminated those figures in valuing the gas purchase contract?

The Witness: That is correct, so if the footnote and the asterisk be marked out, why, this will be correct.

It might be well to make it clear that all of these figures are M. c. f. on a 16.4-pound pressure base, on both Exhibit No. 131 and Exhibit No. 132.

[fol. 4996] By Mr. Littman:

Q. Do I understand your testimony to be that the figures shown in Exhibit 131 for the West Panhandle Field

reflect purchases under the J. M. Huber Corporation and Northern Natural Gas Company purchase contracts throughout all of the years shown?

A. That is correct, yes, sir.

Q. Is my understanding correct that Exhibit No. 131 relates to what you have called, in your Exhibit 42, the "anticipated load" and sometimes the "future expected load"? A. Yes, that is correct.

Q. And the Exhibit No. 132 has reference to the so-called "basic load", is that right?

A. And the basic load is the approximate present load—not the present, the 1940-41 load.

Q. The figures on Exhibit No. 132 in the extreme right-hand column, "Total Main Line" are the total sales figures which were estimated by Mr. Morton, are they not?

A. No, I do not believe they are based entirely on Mr. Morton's estimate. It is a 12-months' load ending—yes, they are six months actual, and six months estimated, is what it is.

Q. That is for the year 1941?

A. 1941, yes, sir.

Q. What about the years 1942 through 1960?

[fol. 4997] A. If you will notice, that figure is constant through all years.

Q. I was speaking of Exhibit 131, Mr. Hinton.

A. Excuse me, I thought you said, 132.

Q. I am speaking of the anticipated load.

A. Yes, those are Mr. Morton's estimated figures.

Q. Weren't there some adjustments made from Mr. Morton's sales figures to arrive at those shown in the extreme right-hand column, Exhibit No. 131?

A. Yes, these do not represent sales at all. These figures are production figures and the title, I believe, will make it clear, "Future Division of Production Between Fields."

Mr. Morton's figures were handed to me on the basis of sales. From that we have determined, through years of operation, about what percent of line loss we can expect to encounter, and we know, by many years experience and operation, about what fuel will be required for the compressor stations.

Therefore, that amount of gas is added to the sales to establish the required input at the Liberal compressor station.

Mr. Culton: Does this include gas used for testing and clean-outs and things like that?

The Witness: No.

Mr. Culton: It is only the gas that goes into the line?

The Witness: Line loss. In other words, if we would have a serious line failure, why, that gas would not come [fol. 4998] in as a flat percent application to the sales load.

Mr. Culton: What I am getting at, though, do you include in this the gas which is used in testing the wells or clean-out jobs, or things like that, or would that be in addition to this?

The Witness: No, sir, as I have said, this is the required amount at the intake side of the Liberal station.

By Mr. Lattman:

Q. And you have also made an adjustment to a 16.4-pound pressure base, have you not?

A. Yes, our sales are on a 14.73, or 30 inches of mercury, saturated, and our field pressures, our production pressures, are on a 16.4-pound pressure base.

Q. On Page 38 of your written testimony contained in Exhibit 42, in the last paragraph, you state that you developed a pressure trend curve for the Panhandle Field as a whole, based on past performances and on the assumption that the pressure reports of the Texas Railroad Commission are accurate. Is that correct?

A. That is right.

Q. Will you produce that pressure trend curve?

A. Yes.

Mr. Lattman: Mr. Examiner, I would like to have marked for identification as Exhibit No. 133, a chart entitled, "Panhandle Field, Texas, Pressure Trend." May this be marked?

[fol. 4999] Trial Examiner: This proposed exhibit will be identified as Exhibit No. 133.

(Exhibit No. 133 was marked for identification.)

By Mr. Littman:

Q. I hand you Exhibit No. 133, Mr. Hinton, and ask you if this chart shows the curves to which you referred in the testimony to which I just alluded a moment ago?

A. Yes, it does.

Mr. Littman: If your Honor please, we do not have copies of this chart.

Mr. Wheat: Possibly it won't be necessary, on this particularly technical chart, Mr. Littman, to bother about copies.

Mr. Littman: We are having marked for identification as exhibits our own copies. Perhaps we can later determine whether we want additional copies or not.

Mr. Culton: We have no point about it.

Mr. Littman: You have the tracings for this chart, have you not?

The Witness: Yes, I do.

Mr. Littman: And copies could be readily made if they are required?

The Witness: Right.

Mr. Littman: Are the tracings in Kansas City?

The Witness: They are.

By Mr. Littman:

[fol. 5000] Q. Was the curve shown in Exhibit No. 133 developed from data contained in your working papers, which data are shown in a sheet of your working papers which I now hand you? A. Yes, it was.

Mr. Littman: I would like to have marked for identification as Exhibit No. 134, the sheet I just handed the witness, entitled, —

The Witness: (Interposing) But not this sheet alone. This is the application of withdrawals applied to the performance of the field. This is a portion of the calculations used in extending the curves.

Mr. Littman: Well, am I correct in understanding that the sheet of your working paper, a photostatic copy of

which I now hand you and which I will have marked for identification, does contain certain data from which you derived the curves shown in Exhibit No. 133?

The Witness: That is right. This is the past production and estimated future production from the Panhandle Field, Texas, on a 16.4 pressure base.

Mr. Littman: I would like to have marked for identification the photostatic copy of one sheet of Mr. Hinton's working papers, which is entitled, "Past Production & Estimated Future Production from Panhandle Field, Texas, 16.4 Pound Pressure Base," as Exhibit No. 134.

Trial Examiner: It will be so marked.

[fol. 5001] (Exhibit No. 134 was marked for identification.)

By Mr. Littman:

Q. Doesn't Exhibit No. 134 contain the data from which you plotted the curves which appear in Exhibit No. 133?

A. It contains the result of previous data, and the curves were plotted from this result marked in Columns A, B and C.

Q. Now, I would like to have you explain the source and derivation of the figures shown in Exhibit No. 134.

At the left hand column, you show the years first in 1926 and earlier, and then each of the years 1927 down through 1960, do you not?

A. That is correct, as far as the annual withdrawals are concerned. The pressures are not shown for years previous to 1935, because it was impossible to obtain data to establish those pressures.

Q. Well, I was just talking about the column headed "Year" for the present.

Now, are those calendar periods from January 1 to December 31 of each of the years shown?

A. Yes, those are calendar years.

Q. Now, in the second column, you show figures which are called, "Annual Withdrawal M. M. C. F."

Now, what do those figures represent?

A. The annual withdrawals from the Panhandle Field, Texas.

[fol. 5002] Q. Now, the first figure of 247,425 M. m. c. f. represents the amount of gas withdrawn from the beginning of the Panhandle Field through the calendar year 1926, is that correct?

A. As nearly as it was possible to obtain a correct figure at that time of the unmetered gas that there was. There was a considerable quantity of gas estimated for that year.

Q. What is the source of those figures headed, "Annual withdrawal"?

A. For the year 1926 and earlier—

Q. (Interposing) Well, for all the years shown. If the sources are different for the various years, you might give each.

A. They are different. Up to the year 1935, I might say midyear, 1934, those figures shown are from a combination of actual-metered gas and the best judgment that Victor Cotner and H. C. Crum were able to apply to the unmetered gas.

I have talked to Mr. Cotner in detail about how he went out and gathered this information and I feel that, as far as the actual gasoline plants and the metered gas is concerned, that those figures shown are fairly close to accurate.

However, I do not think that this represents the total amount of gas that came from the Panhandle Field.

Q. You mean the amount that has been taken out is larger than that represented by the figures shown in your column headed, "Annual Withdrawal" on Exhibit No. 134?

[fol. 5003] A. Yes, I think it is larger and there is more than one certain specific thing that leads me to believe that.

One is the action of pressure curves, of which I have probably plotted a hundred in the last ten years on this field, trying to arrive at some method of finding what we could expect in the future, and the other is the fact that we know that there has been a great deal of gas produced

from this field through oil well production which has been termed as "casing head gas."

Q. And the casing head gas is not included in the figures headed, "Annual Withdrawal"?

A. Not up to that time, because it was not compulsory to meter casing head gas. There was no gas-oil ratio, and it was possible for an oil producer to use any amount of gas that he desired, to produce a barrel of oil.

Q. Up to what time?

A. Let's see, I believe that started in the early part of 1935, but I am sure that by August, 1935, that it was effective.

Q. In other words, the figures after August, 1935, include the casing head gas?

A. They do include the casing head gas.

Q. But prior thereto—

A. (Interposing) No, it is just an estimate of it, and it is pretty difficult to make an estimate of casing head gas.

[fol. 5004] It is fairly easy to make an estimate of gas that is used in gasoline plants and that is not metered because it is possible to know the capacity of those plants, but when you are just producing gas to the air, it is a pretty difficult proposition to make too accurate an estimate of it.

Q. Now, have you given all of the sources of the figures shown in the column headed, "Annual Withdrawal"?

A. I believe that there is some consideration given there to gas blown to air, that is, after the year 1935.

Q. I believe you explained that you secured the figures through the year 1935 and prior thereto from an estimate made by Messrs. Cotner and Crum?

A. Prior to that date, yes, sir.

Q. Prior to 1935? A. Yes.

Q. Now, what is the source of the figures from January 1, 1935, to the end of 1940?

A. The Railroad Commission records.

Q. Of Texas?

A. Of Texas, along with certain additions which it was felt should be added to give consideration to the pound decline and not getting a warped idea of potential recovery, the addition being that of gas necessary in the drilling in of new wells and the blowing of old wells, both

during maintenance periods and for the purpose of cleaning well bores.

[fol. 5005] Q. Then the figures include, as they stand in the second column of this exhibit, the total gas production from the Texas Panhandle Field?

A. Yes, as nearly as it can be estimated along with the well-established data, that is, the metered gas.

Q. Including casing head gas? A. Yes.

Q. Throughout all of the years shown?

A. Not all of the casing head gas up to 1935, because at that time they were paying particular attention to the gasoline plant use, rather than trying to trace down casing head gas.

Q. Do your working papers contain and show the assembly of the figures from the various sources that you have described?

A. I am not sure whether they do or they do not. If mine don't, I believe that those of Rufus Smith will probably show those.

You understand, in getting up a list of figures like this, it is necessary to almost go and visit with the [follows] who have compiled these figures in the early days, to feel sure that they may be depended upon and I have talked with Mr. Peterson, and he has compiled a great many figures; Mr. McCue of the Columbian Fuel Company.

I have talked with Mr. Cotner and I have talked to Mr. Hughes, and I talked to Mr. Massa. All of these gentlemen [fol. 5006] have lived in the Panhandle with this gas field, and I believe that the figures shown here are about as accurate as could be obtained, but I am not sure that I do have the details showing how these figures were finally reached.

Mr. Culton: Mr. Hinton, can you tell us who these gentlemen are? I do not know whether the record shows as to all of them or not?

The Witness: Mr. Peterson is geologist for the Texas Natural Gas Company, and Mr. McCue is a scout out of the Amarillo office of the Columbian Fuel Company, and Mr. Cotner is Vice President of the Columbian Fuel Company who lives in New York now. He moved up there recently.

Mr. Massa is a consulting engineer at Pampa, Texas, and Mr. Hughes is a consulting geologist at Amarillo, Texas.

Mr. Culton: Mr. Massa was in charge of the Pampa office of the Railroad Commission for a number of years, was he not?

The Witness: He was. He is probably more familiar with the old records of the Railroad Commission at Pampa than anyone you would be able to contact.

By Mr. Littman:

Q. We have Mr. Smith's working papers, and will ask you to refer us to the breakdown and the various sources for these figures shown in Column 2.

A. There may be some slight discrepancy between the two sets of figures where matters of judgment entered in, [fol. 5007] but they will be very close.

Q. Perhaps during the noon recess we can have the breakdown of the figures and the sources? A. Yes.

I am glad to learn that you have Mr. Smith's papers, because I was held responsible for them, and I did not know where they were.

Q. Now, the figures in the third column headed "Cumulative Withdrawal M. M. C. F." are simply the cumulative figures for the years shown, are they not?

A. That is correct.

Q. Will you state the source of the data shown in the next column, headed "Pressure Decline, Well Head Gage"?

A. That comes from the data of the Railroad Commission of Texas.

Q. Wouldn't it be more correct to say that the figures shown in the column headed "Pressure Decline" represent the remaining well head pressures for each of the years 1935 to 1939?

A. In all probability, that would be an improvement on the heading which I have.

Q. We just wanted to make certain that we understood those figures.

A. I think it would be clearer that way, yes, sir, Mr. Littman.

[fol. 5008] Q. Now, as of what date or dates are these pressure readings which are shown in Column 4?

A. Those are midyear pressures.

Q. Over what period are they taken?

A. Do you mean how many months does it take to take the pressures in the field?

Q. Yes.

A. It is according to how many engineers they can get from Texas A. and M. and Texas University.

Q. By "they", you mean the Texas Railroad Commission?

A. The Texas Railroad Commission. If they have a good bunch of young engineers available, why, it does not take so long, but last year we had to wait for a long time before we could even start on ours, because there was a shortage on engineers.

I would say that if they had engineers, that it would take about three months to take all of the well head pressures in the field.

Q. And the three-month period might be longer, or might be less for each of the years? A. That is right.

Q. And it might start and end at different dates in each of the years?

A. Yes, it would in all probability be within the vacation period, that being along about the first of July until [fol. 5009] the first of September.

Mr. Culton: I wonder if it would help the record to have the witness say what has to be done in taking those pressures?

The Witness: In the matter of just taking pressures, we are using the dead weight gage now, and all that is required is to make a connection of the dead weight gage on a pressure tap at the well head, and balance the dead weight gage against the well head pressure.

Mr. Culton: Has that always been the practice?

The Witness: No, sir, there were very few dead weight pressures taken prior to 1939.

Mr. Culton: At the time these pressures are taken, are the potentials also taken?

The Witness: They always have been, up until the past year, and the past year they were so late getting started that instead of taking potentials, they merely took well head pressures and declined the 1940 back pressure open flow tests on the basis of the pressure drop.

This is the first year that potentials have not been taken along with the pressures.

Mr. Lee: What do you mean by "potentials"?

The Witness: The open flow, more commonly known.

By Mr. Littman:

Q. You just referred to the "Past year". What year [fol. 5010] did you mean?

A. 1941 is the first year that potentials have not been taken in midyear since the Railroad Commission started to function.

Q. In the next column headed, "Estimated Annual Withdrawal, Condition No. 1, M. M. C. F.", you have certain figures running from 1941 to 1960, inclusive.

Will you please give the source of those figures?

A. Those figures are my own estimate, which was made by talking to various representatives of other companies, by knowing that the carbon black load will, in all probability, remain approximately as it is, and studying the weekly reports which I get, which is a comparison of the amounts of gas taken by each major pipe line company from this field, and the amounts that I have put down here are based upon those things.

Q. Do these weekly reports have a title? A. Yes.

Q. What are they called?

A. Comparison of Deliveries, I believe it is. I might have a copy here. If I don't, I have them at the hotel.

Q. Who publishes the paper?

A. They are published by all of the major pipe line companies producing gas in the Panhandle Field, and they furnish this data to a stenographer in Amarillo each week, who types it and sends copies to the various companies.

[fol. 5011] Q. We would like to have the title of that weekly paper, if you can give it to us.

A. I do have a file over at the hotel on it, and I will bring it back after lunch.

Q. Very well. That weekly paper does not make any estimate of the amount of gas expected to be withdrawn in the future, does it?

A. No, sir.

Q. But you have based your estimate for the next 19 of 20 years upon that information, is that correct?

A. Not altogether, no.

Now, in the column of figures that we are referring to at this time, you will note that there is no increase shown from 1941.

That reaches its maximum in that year.

Q. The figure being 610 millions M.c.f.?

A. That is right.

Q. Were you going to say something further about that? A. No, sir.

Q. Now, you refer to a "Condition No. 1" at the head of that column. A. That is right.

Q. Will you explain what that condition represents?

A. Condition No. 1 contemplates that the rate of withdrawal from the Panhandle Field will remain static, or [fol. 5012] approximately what it was during the year 1941.

Q. Now, you have a column of figures further on, headed "Estimated Annual Withdrawal, Condition No. 2."

A. Yes.

Q. Will you explain the meaning of Condition No. 2?

A. The annual withdrawal estimated under Condition No. 2 is based on the assumption that all other companies will continue to produce gas in the same quantities as in 1941, but that Panhandle Eastern will increase its rate of withdrawal in accordance with Schedule 5, Exhibit 43.

Q. That is, in accordance with Mr. Morton's estimate of future sales?

A. Yes, sir, adjusted for line loss and pressure base and fuel.

Q. Now, you have another column that contains a somewhat similar set of figures, headed "Estimated Annual Withdrawal, Condition No. 3."

What condition does that represent?

A. That represents the condition which I feel will be the actual condition, and that gives consideration to increased withdrawals by not only Panhandle Eastern, but by some of the other pipe line companies taking gas from the Panhandle Field.

Q. That condition, you say, represents more nearly the condition which you would expect to prevail in the next [fol. 5013] 19 or 20 years?

A. Yes.

Q. And it includes the increased production, not only of Panhandle Eastern, but of other pipe line companies?

A. That is correct.

Q. And what is the source of those figures?

A. Well, of course, ours is based on Mr. Morton's estimate of sales. We know that Texoma is not looping their pipe line into Chicago to carry the same amount of gas, and there has been an estimate made for that purpose.

I might say that the increases shown here are all for pipe line gas, and does not include any increase in the gasoline and carbon black plants in the Panhandle nor of the local market there.

Q. You do not expect any increases in that regard, do you?

A. Well, I am hoping for that, anyway. I believe that is right, because those plants now are operating and have been, at fairly full capacity, and I do not think that they are going to be able to get material to build plants very soon, even if they wanted to, but I do not believe they are going to build more carbon black plants in that field.

Q. Mr. Hinton, did you consult with any of the other pipe line companies that operate in the Panhandle Field in arriving at this particular estimate of Condition No. 3, [fol. 5014] or was it your own study?

A. I would say that it was largely my own, because I do not recall going to any individual of any company and asking them how much gas they were going to produce over the next few years, and asking them to furnish the detail of it; but it is one of those things that you just get to know by being around the field.

[fol. 5015] By Mr. Littman:

Q. Mr. Hinton, just before the noon recess, we were discussing Exhibit No. 134.

A. That is the photostatic sheet.

Q. That is the photostatic copy of your working sheet entitled, "Past Production and Estimated Future Production from Panhandle Field".

Now, you have letters "A", "B", and "C" shown on this chart. Will you please explain what those letters mean?

A. The letter "A" covers the three columns which show the annual withdrawal based on no change in withdrawal from the approximate 1941 rate of production.

The next column merely is a cumulative withdrawal, which is obtained by adding to the total withdrawal the annual withdrawal.

The third column is the remaining pressure at the different stages of the total withdrawal from the field.

Q. Well, then, am I correct in understanding that the letter "A" applies to those three columns that you just described?

[fol. 5016] A. That is correct.

Q. And am I correct in understanding that the letter "A" means Condition No. 1? A. That is correct.

Q. And the letter "B" applies to the next three columns, that is, the middle three, and refers to Condition 2?

A. Yes, sir.

Q. And the letter "C" refers to the last three columns on the right-hand side of the page and refers to Condition 3?

A. That is correct.

Q. And you have described those three conditions in your testimony this morning, have you not?

A. Yes, sir.

Q. Now, will you please state the source of the figures which appear in the three columns headed, "Estimated Pressure Decline", Condition No. 1; Condition No. 2 and Condition No. 3?

A. The source of those estimated pressures comes from the result of the application of future estimated withdrawals based upon past field performance.

Q. In other words, these rock pressure figures, which I believe you have already explained, really represent

the rock pressure average for the entire Panhandle Field for each of the years shown, for 1941 through 1960 and are estimated, are they?

A. They are. Naturally, any future figure would have to be an estimated figure:

[fol. 5017] Q. Is the 1940 figure for the three conditions relating to the rock pressure estimated?

A. No, it is not.

Q. That is an actual figure, based upon the reports of the Texas Railroad Commission?

A. That is right, it is data compiled by the Railroad Commission of Texas.

Q. Now, I would like to make certain that I understand these rock pressure figures.

Referring to the column headed, "Estimated Pressure Decline, Condition No. 1", you show 314.10 pounds in 1940. Is that correct?

A. That is correct. That is a weighted average figure, and not an equilibrium figure.

Q. Now, all the figures you show in Exhibit 134 relate to the entire Panhandle Field, do they not, both East and West? A. Sweet and sour.

Q. And East and West?

A. East and West, yes, sir.

Q. Now, the 314.10 pounds of rock pressure is the Texas Railroad Commission's estimate of the average rock pressure throughout the entire Panhandle Field as of the middle of the year 1940? A. That is correct.

Q. Are you sure that doesn't mean as of the end of the [fol. 5018] year 1940?

A. That is mid-year 1940, because that would be the only time that that figure could be obtained.

Q. But the estimated cumulative withdrawal figure shown in the column to the immediate left represents the figures of withdrawals as of the end of the year 1940. Is that correct?

A. I believe that is correct, yes.

Q. Now, in 1941, under Condition 1, which you also refer to as Condition "A", you show that the rock pressure has declined to 303.07 pounds.

A. That is right.

Q. Now, does that mean that after the 610 million M. c.f. have been taken out in the year 1941, that such with-

drawal will produce a rock pressure decline from 314.10 pounds to 303.7 pounds?

A. Yes, sir, a total decline of 11.03 pounds.

Q. Mr. Hinton, I hand you a copy of the Texas Railroad Commission's annual report for the Panhandle oil and gas field, dated July, 1940, and ask you to please check this report and make certain that your rock pressure figures are as of the middle of the year, rather than as of the end of the year shown.

A. The pressure shown there is as of the end of the year 1940, instead of midyear, as I believed them to be. The weighted average pressure at the middle of the year on the total acres in the Panhandle Field was 318.33, and the de-[fol. 5019] cline from the middle of the year to the last of the year by extrapolation of the pressure curves gives the 314.10 pressure.

Q. And is it a fact that all of the rock pressure figures that you show in Exhibit 134 are as of the end of each of the years shown, instead as of the middle of the years shown, as you have previously testified?

A. Yes, that is right. I recall now that I did do that in order to avoid splitting up the production into midyear periods, which means that we would have to take those from the records month by month instead of in annual figures, so I do remember now that I used the last-of-the-year figures throughout the curves.

Q. And throughout Exhibit 134? A. Yes, sir.

Mr. Culton: You extrapolated to get that figure?

The Witness: That is right. Of course, it is all obtained by extrapolation of past performance, and it was just as easy to go to the end of the year as it was to the middle of the year.

Then I wouldn't have to split my estimated annual withdrawal, because, in order to do that, I would have to go back and obtain the history to find out what percent was produced the first six months, and what percent was produced the last six months of the total year.

By Mr. Littman:

Q. Well, I merely wanted to make certain that we under-[fol. 5020] stood your table.

A. Well, I am grateful to you for straightening me out on that, because we so often work to midyear pressures that

I had in mind that I worked this problem in that manner, but I see that I haven't.

Q. Mr. Hinton, would you mind if we were to number the columns in Exhibit 134 in order to facilitate the cross-examination?

Starting with the column headed, "Year", suppose we call that Column 1, and then go right across from left to right until we reach Column 13?

A. I think it is a very good idea.

Would you mind numbering that last column so we don't have 13 columns on this sheet?

Q. It is all right with me. What do you want to call the last column?

A. We wouldn't have to refer to it, but the number will be on there.

Q. Referring now to Column 7, is my understanding correct that at the end of the year 1942, you estimate that the average rock pressure throughout the Panhandle Field as of December 31, 1942, will be 291.26 pounds, as compared with 303.07 pounds at December 31, 1941?

A. That is correct, keeping in mind that these are all weighted with horizontal acreage.

[fol. 5021] Q. These are weighted?

A. With horizontal measurement of acreage.

Q. And in order to produce that drop in rock pressure, 610 million M. c. f. will have been withdrawn in the calendar year 1942, as shown in Column 5?

A. That is correct.

Q. That same method holds true throughout the balance of Columns 5 and 7, is that correct?

A. That is correct.

Q. And the same general method holds true for Columns 8 and 10?

A. That is correct.

Q. And for Columns 11 and 13?

A. That is correct.

Q. Now, I believe you have testified that the rock pressure decline from December 31, 1940, to December 31, 1941, under Condition "A", for example, would be 11.03 pounds? A. That is correct.

Q. And the drop for the next year, and that is to December 31, 1942, would be 11.81 pounds. Is that right?

A. That is correct.

Q. Let's go further down Column "A". Looking at the figures for 1949, your rock pressure reading as of December 31 of that year is 194.90 pounds, is that right?

A. That is correct.

[fol. 5022] Q. And as of December 31, 1950, the rock pressure reading is 178.95 pounds. Is that right?

A. That is right.

Q. A drop of 15.95 pounds between those two years. Is that right? A. That is correct, yes, sir.

Q. And what production do you estimate will have occurred in the Panhandle Field in that calendar year?

A. 610 million M. c. f.

Q. And that is the same amount under Condition "A" or Condition 1, which you stated would be withdrawn in 1941. Is that correct?

A. That is absolutely correct.

Q. Now, in 1941, according to this table, the production of 610 million M. c. f. produced a pressure drop of 11.03 pounds, as compared with 15.95 pounds for the same production in 1950.

A. That is correct.

Q. All of which indicates that you assumed that there would be less production per pound of drop in rock pressure in the Panhandle Field. Is that right?

A. Yes, sir, it is assumed that the field performance will continue in the same manner as heretofore.

Q. Now, without going through each of the comparable columns and all of the figures in each column under Conditions "A", "B" and "C", sometimes called Conditions 1, 2 and 3, the same situation generally prevails in Exhibit 124, does it not? A. Yes, sir.

Q. Namely, that you have an accelerated drop in rock pressure per million M. c. f. of gas produced?

A. That is correct. In all cases past field performance has been carried to the future.

Q. Now, you developed a line or curve for purposes of arriving at the future production per drop in rock pressure, did you not? A. Yes, sir.

Q. Do you have that curve, or the chart upon which that chart was plotted in your working papers? A. I do.

Mr. Culton: Which area is that?

The Witness: This is for the field.

Mr. Littman: If your Honor please, I would like to have marked for identification as Exhibit No. 135, a chart called "Panhandle Field Performance-Rate of Pressure Drop from 1935 to 1940".

Trial Examiner: It will be so marked.

(Exhibit No. 135 Was Marked For Identification.)

By Mr. Littman:

Q. Referring to Exhibit No. 135, is that the chart to [fol. 5024] which you just referred as being the chart on which you worked out the rate of production per pound of rock pressure decline? A. That is correct.

Q. Now, if I correctly understand this chart, the vertical readings show the rock pressure decline throughout the entire Panhandle Field in weight, is that correct?

A. Weighted only horizontally. There is no vertical weighting of the area.

Q. And am I correct in stating that the horizontal readings show the withdrawals in trillions of cubic feet?

A. That is right. The total withdrawal from the Panhandle Fields.

Q. Now, looking over at the extreme left-hand side of your chart, Exhibit No. 135, the one represents 1 trillion cubic feet, does it not?

A. That is right.

Q. And how many pounds of decline in rock pressure, according to this chart, was required to produce that first billion M. c. f. out of the Panhandle Field?

A. The first trillion?

Q. Yes.

A. Why, according to this chart here, 6.62 pounds were required; but, if you will notice, I have made this a broken line from 1935 back to the beginning of the field, because, in my opinion, the total amount of gas that has been accumulated to this date does not represent the total amount of gas that has actually been taken from the field, because I am sure that there has been a great deal of the gas that does not show in those figures that has been produced through oil wells.

Mr. Culton: That is during the early years, prior to 1935?

The Witness: That is right.

By Mr. Littman:

Q. I was asking these questions at this time, Mr. Hinton, primarily for the purpose of ascertaining how this chart, Exhibit No. 135, works:

We can discuss those phases a little later, but what decline in rock pressure was required, according to this chart, to produce the first trillion?

A. 5.82 pounds.

Q. What decline in rock pressure was required to produce the second trillion? A. Approximately 8.2.

Q. Now, you are reading these figures at the point where the dotted line crosses the line designated "2", at the bottom of the chart; is that correct?

A. That is correct.

Q. And according to this chart, what decline in rock pressure was required to produce the third trillion?

A. 9.63 pounds.

[fol. 5026] Q. Will you state the amount of rock pressure decline required to produce the fourth trillion?

A. That is approximately 11.2 pounds.

Q. In other words, each successive trillion cubic feet of gas that is withdrawn from the Panhandle Field, according to this chart, if taken literally, requires a greater amount of rock pressure decline, does it not, or brings about a greater decline in rock pressure?

A. That is so shown by taking the horizontally weighted pressures from 1935 through 1940, and placing a dot on the chart to represent the decline for the amount produced at the stages of total withdrawal from the field.

Now, I said yesterday that I did not feel that there had ever been a true equilibrium pressure reached in the Panhandle Field. If it were the case that there had been a true equilibrium pressure reached in this field each year, then the application of Boyle's Law to this problem would place these dots in a perfectly horizontal line that would be exactly straight across the paper.

Q. If I correctly understand your last answer, if Boyle's Law were to be applied, and if there were no devia-

tion from Boyle's Law, then you would have across this chart a straight, horizontal line, rather than the descending line shown on this chart.

A. That is correct.

[fol. 5027] Q. In other words, if you had a straight, horizontal line across this chart, you would have a uniform drop in rock pressure for each trillion cubic feet produced in the Panhandle Field throughout its life. Is that correct?

A. Yes, sir.

Q. Now, what drop in rock pressure is shown by your chart, Exhibit No. 135, in order to produce the fifth trillion cubic feet?

A. 12.42 pounds.

Q. Now, that brings us pretty close to the year 1935, does it not?

A. That is correct.

Mr. Culton: By the way, could you tell us what the aggregate is, up to that time?

The Witness: Aggregate production, do you mean?

Mr. Culton: The aggregate drop.

The Witness: Yes. That would be approximately 353 pounds.

Mr. Culton: That is down to 350?

The Witness: Yes; that would be the average weighted pressure, weighted only horizontally, for the entire field. The original pressure is generally taken to be 430 pounds.

However, pressures higher than 430 pounds were recorded in the yearly days in portions of the field.

By Mr. Littman:

Q. So the 435-pound figure is the average, is it not?

[fol. 5028] A. No, I think 430 is the accepted pressure, original pressure.

Mr. Culton: You are thinking of Hugoton.

By Mr. Littman:

Q. Now, as of what date did you just give the information requested by Mr. Culton?

A. At the beginning of 1935.

Q. By the way, a moment ago I asked you to describe the vertical readings on this chart and, perhaps, I may have been a little misleading.

Would it be correct to say that the vertical readings on the chart, Exhibit No. 135, really represent the rate of drop in rock pressure?

A. Yes; sir. I think the vertical captions, more properly described, would be the rate of pressure decline in pounds based on the weighted average itself, being based only on the application of the horizontal surface, and not giving consideration in any place to the thickness of pay in the field.

Q. Now, we have reached the portion of your line which is solid. That extends from a point slightly beyond the fifth trillion cubic feet, to a point slightly beyond the eighth trillion cubic feet.

Is that, generally, the production that was taken from the Panhandle Field between 1935 and approximately 1940?

[fol. 5029] A. That is correct. That is the amount of gas produced for that period.

Q. Now, let us take 1940 as an example, particularly the eighth trillion cubic feet measurement. Will you state the decline in rock pressure required, according to your chart, to produce the eighth trillion?

A. 16.62 pounds.

Q. Now, let's look at a few of the units into the more distant future. Let us take, for instance, the fifteenth trillion. What decline is required to produce that single fifteenth trillion?

A. That will be about 26.47 pounds.

Mr. Culton: 47 or 37?

The Witness: 26.47 is what I read on the chart.

Mr. Culton: Right.

By Mr. Littman:

Q. Now, the last figure you show is for the 21st trillion cubic feet that will be taken out of the Panhandle Field. Will you give us the rock pressure that you estimate will be required to produce that 21 trillion?

A. If and when it is possible to take 21 trillion cubic feet from this field, the amount of pressure decline that will be experienced at a comparable rate of withdrawal will be 35.2 pounds.

[fol. 5030] Q. In other words, it will require approximately 35 pounds of rock pressure drop to produce the 21st trillion cubic feet in the Panhandle Field, if and when it is produced, as compared with a drop of slightly more than 5 pounds to produce the first trillion cubic feet. Is that correct?

A. That is based on the method by which the field has been developed, the well spacing, taking everything into consideration, that is correct.

Q. Do you expect the figures to extend beyond the 21st trillion? A. No.

Q. Is that why you quit?

A. Well, I might have been able to quit one earlier and, from the standpoint of our company, I think I could probably have quit two earlier.

Q. You mean t-o-o?

A. I mean, t-w-o, because I think there will be considerable gas taken from the Panhandle Field after the time that we cease to produce gas from that field.

Q. Well, we will come back to this chart a little later, but I understand that this chart shows the rate of production per pound of drop in rock pressure decline; or, stated conversely, the rate of drop of rock pressure per trillion cubic feet produced in the Panhandle Field?

A. That is hardly correct, yet. It is the rate of drop [fol. 5031] at various stages of total withdrawal through the field.

Q. At any rate, you utilized, for purposes of your study in Exhibit 42 and Exhibit 43, the rates of rock pressure decline and production reflected in your chart, Exhibit No. 135, did you not?

A. Yes, I believe that is right.

Q. And was it by the application of those rates that you secured the rock pressure readings or estimates as shown in Exhibit 134, in Columns 7, 10 and 13?

A. Yes, sir, and so produced on Exhibit No. 133 with each curve identified by the letters "A", "B" and "C", which are, likewise, shown on Exhibit No. 134 in Columns 7, 10 and 13.

Q. Well, I wanted to make certain that I was correct in understanding that when you wanted to determine the figure to use for the rock pressure reading in 1942, let us say, as shown in Column 7, of 291.26 pounds, you first determined how much gas was going to be withdrawn in that year, and then you applied the rate of drop per unit of production to the rock pressure of the preceding year, in order to secure the reading for 1942, and you used Exhibit No. 135 for that purpose. Is that right?

A. That is correct. When I found that there was a constant in the acceleration, then it became apparent that this could be applied to the remaining years of the field [fol. 5032] and the rate of withdrawal and the total withdrawal would govern the weighted average pressure.

Again, when I speak of weighted, I am referring to only the horizontal weighting of the field.

Q. Now, Mr. Hinton, in order that we may better understand your Exhibit No. 134, what result would you have obtained in Columns 7, 10 and 13, if you had used a constant rate of drop per trillion cubic feet withdrawn?

A. I would have obtained a result which would have had a high percentage of error in it.

Q. Mr. Hinton, I am asking what the mathematical effect would be upon the figures shown in those columns.

A. That would be all in accordance with what number of pounds was used per trillion. If you would use one pound per trillion, of course the drop would be very slight. If you used 50 pounds per trillion, why, then it would show a comparatively short life for the field.

You see that you would have to know what to apply before it would be possible to arrive at any answer at all that would be worth consideration.

Q. Let me put what I had in mind this way, Mr. Hinton:

Looking at Column 7 of Exhibit 134, you have in 1940 a rock pressure reading of 314.10 pounds, whereas in 1959, you have a rock pressure reading of 18.31 pounds, estimated.

Now, if you had used a constant rate of drop, the effect [fol. 5033] would have been to give you a much larger remaining rock pressure at 1959, would it not?

A. I want to make one calculation before I answer that, please. In answering your question just asked, I would say that this calculation indicates that if you would have taken a drop of 15.57 pounds per trillion, that we would have ended at the same point on the curve, except the curve would have been a straight line, instead of a curve parabola.

Mr. Littman: Will you read the answer, please?

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. Which point are you talking about, and which curve are you talking about?

A. I am talking about the Exhibit 133. The time element is the point considered, which would be the same year for each of the Curves "A", "B" and "C".

Q. And, of course, if 10 pounds were used instead of 15, that you just mentioned, Columns 7, 10 and 13 would have extended beyond 1960, would they not?

A. Yes; or if we would use 5, it would extend twice as long as that, but we know now that it takes more than 10 pounds to produce a trillion, because we have already passed that point in the rate of pressure decline per trillion feet produced.

Even now, with the feeding in of the marginal acreage, [fol. 5034] and the fact that the area of thin pay in this weighted average carries the same value as the areas of much thicker pay, we have already arrived at a point where it takes more than 10 pounds.

Of course, we know that 10 pounds would not get the right answer.

Q. We will discuss those matters a little further, later.

At this stage, I was endeavoring to ascertain if we understood the various methods and assumptions which would have an effect upon the answer.

A. If there is any other question that isn't clear, I would appreciate your asking it, because I would like for everybody to understand this.

Q. All right.

Now, did you develop a formula from Exhibit 135, from which you could compute the production per pound drop in rock pressure decline through the years, or did you work directly from the chart, Exhibit 135?

A. No, I did neither. I arrived at a constant, and I applied the constant all the way through. There is no formula involved.

Q. What was the constant?

A. I believe it was 1.141.

Q. What do you mean by that?

A. I mean that for each additional trillion, that the [fol. 5035] number of pounds of pressure decline required was increased at the rate of 1.41 pounds per trillion.

Q. Beginning at what point?

A. That is based from 1935 on, that being the first time in the history of the field that there is data of sufficient accuracy to rely upon.

Q. Well, now, am I correct in understanding that there are two factors, as shown by Exhibit 134, which hasten the end of the life of the field, namely, the estimated annual withdrawals shown in Columns 5, 8 and 11, and the estimated drop in rock pressure shown in Columns 7, 10 and 13?

In other words, am I correct in stating that the greater the amount of annual withdrawals each year, the sooner you will arrive at the end-point of life of the field?

A. That is an indisputable law.

Q. And the faster your decline in rock pressure, the faster, of course, you will reach the end of the life of the field, too?

A. That is correct, but the rate of decline in rock pressure in this particular field is not entirely dependent upon the annual rate of withdrawal.

Q. What is it dependent upon?

A. The acceleration of the rock pressure decline in the field is due to several things.

I think the principle one is that, when working with the [fol. 5036] weighting of this field, that the fourth dimension is left out.

Q. What is that fourth dimension?

A. The length and breadth of the field are taken into consideration, and the pressure is taken into consideration, but no consideration is given to the depth of the reservoir.

Therefore, the weighting of the field, using the data and the factors that are used, would be a great deal like trying to tell how many thousands of gallons of water were in a lake, without knowing how deep it is.

Q. And that is what you mean by the fourth dimension?

A. That is right. You have to have length, breadth, thickness and pressure in the computation of the amount of gas in a reservoir.

Q. Now, without going into detail at this time, am I correct in understanding that the solid line shown in Exhibit 135, and which represents a comparatively short section of the entire line, was plotted from five points? Is that correct?

A. That is correct.

Q. And each point represents a year, does it not?

A. No, there are two years between the last two points or between 1938 and 1940.

Q. Now, will you refer to Page 10 of Exhibit 42, and, without going into detail at this time, will you state whether or not the five points from which you plotted the solid line in Exhibit 135 were taken from the data shown in the table [fol. 5037] on that page?

A. The pressure, as I have testified yesterday, is taken from the data of the records of the Railroad Commission of Texas, and it has been so long since I have worked on this that I would have to go back and see whether this is just exactly the take, or whether there is an amount in there that is added for lease use.

Q. Mr. Hinton, I believe you were going to check some figures during the recess, and tell us how you arrived at the

five points from which you drew the solid line in the chart, designated for identification as Exhibit No. 135.

A. That is right. On Page 10 of Exhibit 42, at the lower part of the page, is a table showing the amount of gas which was withdrawn from the reservoir of the Panhandle Field of Texas for periods of time shown under the first column, the amount of production in M.c.f. under the second, the pressure loss in pounds under the third, and the production per pound loss in M.c.f. under the fourth, [fol. 5038] showing in the fifth column what the indicated content of the field is at various stages, and how the application of anyone of those pressure-loss pounds could obtain an indicated reserve which would be erroneous.

Mr. Culton: By that you mean that no two of them would be the same?

The Witness: That is right.

By Mr. Littman:

Q. Now, the method used there was merely to divide the pressure loss in pounds into the production for that period? You mean to divide the pressure-loss in pounds by the production per M.c.f., do you not?

A. Into it, yes.

Q. Well, now, which do you mean, Mr. Hinton?

A. To give the production per pound loss, you divide the pressure loss in pounds into the production to arrive at the production per pound.

Q. Mr. Hinton, it is my understanding that the division is the other way around.

Will you read the last answer back, please? Maybe I misunderstood.

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. I see. I am sorry.

A. Does that answer your question all right, Mr. Littman?

[fol. 5039]. Q. Well, that doesn't give you the points from which you plotted your line in Exhibit 135, does it, Mr. Hinton?

A. Yes, it does.

Q. Well, suppose you tell us how you arrived at one of the five points by that method.

A. All right.

By dividing 67.49 into 5,197,693,413, the amount of pressure decline per trillion feet was obtained and that point was plotted on Exhibit No. 135 at a point above the horizontal scale or caption, at a point where the total withdrawal had been 5,197,693,413 M.c.f. and, thus, the first point was obtained.

Now, in order to find out what the rate of decline was per trillion, we found the total withdrawal had been that from the beginning of the field to 8-1-35, plus from 8-1-35 to 7-1-36.

Then that rate was plotted on said Exhibit 135.

Do you understand that?

Q. I think I understand what you are saying.

A. I think maybe where you are slightly misled is that the pressure loss in pounds shown here stands for the fractional part of a trillion feet produced.

In other words, that 7.51 actually stands for a withdrawal of 556 billion cubic feet; and for a trillion cubic feet that would be increased by 444 billion.

[fol. 5040] Q. Suppose you make the actual division of those figures on your calculator, Mr. Hinton, and tell us what answer you get by making the calculation. Please tell us what you are doing as you go along, so that we may follow you.

A. That first calculation was merely a check to be sure that my production-per-pound loss was 77,014,270 M.c.f.

I am now placing 67.49 in the calculator. I am dividing that by 5,197,693,413. I find that the average pressure drop per trillion cubic feet at that point is, 12.98 pounds, as shown on the chart.

Q. Now, that is our understanding, and the reason we were confused is because we understood you to say that you were dividing 5,197,693,413 M.c.f. by 67.49 pounds of pressure-loss.

A. Then, I misunderstood your question, because I understood you to ask what the production-per-pound loss was.

Mr. Culton: That was correct for that, was it not?

The Witness: Yes, and that would be the answer for that.

I guess I misunderstood your question.

By Mr. Littman:

Q. Well, we are agreed now that the first point that is plotted on your chart, Exhibit 135, is 12.98 pounds.

A. Yes.

Q. Representing the average pressure-drop per billion M.c.f. withdrawn.

[fol. 5041.] A. And very little consideration has been given to that point, due to the fact that the total production to that date in a large part has been estimated, and it would be well not to place too much confidence in that pressure decline up to that point.

Q. Now, your pressure decline up to—

Mr. Culton: (Interposing) Just a minute. Did you use that in your curve?

The Witness: No, sir, it falls above the curve, and the line is not drawn through it.

Mr. Culton: All right.

By Mr. Littman:

Q. But the line is drawn very close to it?

A. Yes, it so happens that it falls very close to the line; but if it were even further away than it is, I would not place too much confidence in it, or if it fell exactly on the line, I would not place too much confidence in it.

Q. Why?

A. Because the history of the withdrawal is incomplete up to that date.

Q. That is from the beginning of drilling in the field to August 1, 1935?

A. Yes, sir.

Mr. Wheat: Mr. Littman, I believe that you mis-spoke yourself a minute ago. Is that figure and the figure which

[fol. 5042] you will get for the succeeding years in this new column that you are preparing, not pounds of average pressure drop per trillion cubic feet? You said, "billion".

Mr. Littman: I said, "billion M.c.f."

By Mr. Littman:

Q. Well, now, will you calculate the second point from which you plotted your line on Exhibit 135?

A. Yes.

Q. And tell us how you are arriving at it?

A. I am placing 7.51 on the calculator, dividing by 556,485,654, obtaining an answer of 13.495, and I am calling it 13½ pounds.

Q. Where did you put that point in your chart, Exhibit No. 135?

A. I placed that 13½ at a point on the chart where the total withdrawal had been, in round numbers, 5 trillion 700 billion.

Q. Now, is that the point that appears somewhat indistinctly on the chart opposite the year 1936?

A. That is correct.

Q. And the previous point to which you referred is designated "1935"?

A. That is right.

Q. Now, what point did you use for 1937?

A. I assume that the third point, designated on the chart [fol. 5043] as 1937, was computed in the same way from the third row of figures, shown on Page 10 of Exhibit 42, was it not?

A. That is right.

Q. Can you give us the exact figures?

A. Yes. I have this all worked out somewhere. It might save time to calculate it rather than look for it.

A. The total withdrawal for the period ending 7-1-36 to 7-1-37 was 552,281,402, which, divided into 7.95 pounds, gave an average drop of 14.39 per trillion, at such time as the total withdrawal from the field had been 6 trillion, 300 million, approximately.

Mr. Wheat: May I ask a question, Mr. Littman?

Mr. Hinton, this calculation that you are making now could readily be expressed proportionately, couldn't it, by

saying that the pressure-loss in pounds is to the production in M.c.f. as X is to one trillion?

The Witness: I see no reason why that wouldn't apply.

Mr. Wheat: Giving you the figure by that particular calculation?

The Witness: Yes.

Mr. Culton: That is really what you do in the computation, isn't it, because you add certain ciphers to your answer?

The Witness: Yes.

By Mr. Littman:

Q. Now, you have arrived at the 14.39 pounds have you [fol. 5044] not, which you gave a moment ago?

A. Yes.

Q. Now, will you give the next point that you used in drawing your line?

A. The next period is from 7-1-37 to 8-1-38, and the total production was 622,925,161, which, when divided into a pressure-loss of 9.39 pounds, showed that the rate of pressure decline per trillion was 15.07 pounds when the total withdrawal had been 6 trillion, 900 million plus.

Q. And that is the point which is designated in the chart, Exhibit 135, as "1938"?

A. That is correct.

Q. And that point was calculated by you from the data appearing in the table at the bottom of Page 10 of Exhibit 42, covering the 13-months' period from July 1, 1937, to August 1, 1938?

A. That is correct.

Q. I don't believe we have spoken about the previous intervals with respect to dates.

Mr. Wheat: The witness gave the dates.

The Witness: Yes.

By Mr. Littman:

Q. Did you give the dates?

A. I gave the date in each case before the amount of production was read.

[fol. 5045] Q. Now, will you give the information with respect to the fifth point on Exhibit 135?

A. That is a 24-month period extending from 8-1-38 to 8-1-40, during which time the production was 1,152,418,747 M.c.f. with a pressure decline of 19.35 pounds, and the pressure-drop per trillion at that point was 16.79 pounds per trillion, which is shown on Exhibit 135, by an indistinct circle with an arrow pointing out to a 1940 date, at which time the total withdrawal from the field had been about 8 trillion 70 billion cubic feet.

Q. And that covered a 24-months' period from August 1, 1938, to August 1, 1940?

A. Yes, sir.

Q. Now, if I correctly understand your testimony, you used the latter four points and disregarded the first of the five points?

A. That is right. That is, the one which is dated 1935 did not carry any weight in the placing of the line on this chart.

Q. And is it your testimony that if the first point had been considerably above, or considerably below, the dotted line shown, you would have disregarded it in any event?

A. That is correct, because through the history of the field, where there has been available good data, you will notice that the line passes directly through or touches each [fol. 5046] of these points, which could not be possible if there could not be a constant applied to this ever-accelerating rate of pressure decline per billion feet produced.

Q. So that in reality your line, shown on the map as a solid line, and the extension therefore, going from left to right in the dotted line form clear to the right-hand end of the chart, was all predicated upon four points developed from data covering approximately a five-year period from August 1, 1935, to August 1, 1940?

A. That is correct. If more data were available at this time for the next ten years, in all probability this line would take a higher, ascending position than as it is shown on this chart.

That is due to the fact that all gas in the Panhandle Field is saturated with moisture, and as the pressure is lowered, this moisture is dropped in the formation, and as the moisture is deposited in the channels of the field which are permeable, it is ever more difficult for the gas to pass through the formation, so during such time as pressures

are taken with a 72-hour shut-in, it will not be possible for this amount of gas to travel into the well bore and maintain the pressure.

Q. Well, the fact remains that the dotted lines, as well as the solid lines, shown in Exhibit 135, for the present and the future production, and for the past five years' production, are all predicated upon actual data covering but a five-year period?

A. That is right, estimated data for the period up to 8-1-35.

Q. Now, coming back to Exhibit No. 133, which is the pressure-trend chart for the Panhandle Field, it is a fact, is it not, that your three curves on this chart merely reflect in graphic form the data shown in Exhibit 134 in table form?

A. Yes. In addition to that, the performance curve of the Panhandle Field is also shown. It is very indistinct on here, but you will notice that the weighted average pressure of the Railroad Commission data is shown, and I call your attention to the fact that, with the exception of the year 1939, it follows this line of pressure-trend very closely.

Q. Lines "A", "B" and "C" on chart, Exhibit 133, reflect Conditions "A", "B" and "C" which are shown in Exhibit 134, do they not?

A. That is correct.

Q. And it shows that, under Condition "A", the Panhandle Field will have reached 50 pounds of rock pressure in 1958?

A. Yes, that will be 50 pounds well head pressure, and not 50 pounds formation pressure.

Q. That is the same data that is shown in Exhibit No. 134, is it not?

[fol. 5048] A. Yes, sir. I merely mention that to be sure that we were referring to the proper point of pressure observation.

Q. And the same is true of Lines "B" and "C" on chart, Exhibit 133 for identification?

A. That is right. It is merely the data from Exhibit 134, plotted over in graphic form on Exhibit 133.

Q. Well, now, if you had found, from your study, that the life of the Panhandle Field was going to extend beyond 1958, your three curves, shown in Exhibit 133 for identifica-

tion, would not have sloped so abruptly, but would have fallen out further to the right, into the future years. Is that right?

A. That is right, and would have made a number of people very happy.

Q. Including yourself? A. Yes.

Q. And we may agree, may we not, that one of the factors that causes these three curves, shown in Exhibit 133, to fall so rapidly, is the rate of withdrawals from the field? Is that one? A. That is one.

Q. An another is the decelerating rate of production per pound of rock pressure decline?

A. Now, that is true, except when we speak of that decelerating or the acceleration of the pressure decline, we do not want to be confused and apply that to an equilibrium [fol. 5049] pressure.

It must be known that if we had reached an equilibrium pressure each year, and if we did know that that data was actually correct, that an equilibrium pressure had been reached, then there would be no curvature in that line, it would be a straight line because the application of Boyle's Law to that data could only produce a straight line, except for the slight deviation from the pressure there, accounted for by the fact that the gas is not a perfect gas.

Q. You are speaking of the curve shown in Exhibit 133?

A. Yes.

Q. Or the three curves shown in Exhibit 133?

A. Yes.

Mr. Culton: For clarification, you refer to the fact that that 50 pounds would be a well head pressure.

There would result a higher pressure at the sand face?

The Witness: Yes, slightly.

Mr. Culton: And it would, also, be recognition of the fact that there would be pressure gradients existing all over the reservoir?

The Witness: Yes.

Mr. Culton: From the well through the areas in between other wells?

The Witness: The curves produced on Exhibit 133 are [fol. 5050] based on the same type of weighted average pressures as we have referred to heretofore, and they are the ones that do not take into consideration the vertical thickness of pay.

By Mr. Littman:

Q. Now, I have endeavored, Mr. Hinton, to take you through your method, step by step, of arriving at the three curves shown in Exhibit 133.

Now, if I have omitted any steps up to this point whereby you arrived at the curves, I would like to have you give any further explanation, as you may wish to make certain that we have covered the major steps, at least.

A. I believe that it has been pretty well covered.

There is one thing, if I might, I would like to call your attention to, at this time.

Q. Very well.

A. And that is the fact that this year is the first year that actual potential or open flow tests have not been made and the potentials were obtained on back pressure open flow curves of tests made in 1940, and the decline in open flow is wholly dependent upon decline in the well head pressure.

Therefore, everyone, in an effort to keep their open flow or potential as high as possible, has closed their wells in for as long a period as possible before those pressure readings were taken.

I am of the belief that we are going to get a rock [fol. 5051] pressure on the entire field this year that will be somewhat higher than it would have been if tests would have been taken in the same manner as in previous years.

Mr. Wheat: When you say "this year", you mean in July, 1941?

The Witness: July, 1941.

Mr. Culton: In other words, tests this year were not made under the same conditions as tests in previous years?

The Witness: Yes, I just mention that, but, of course, that will right itself down through the years, because when

the back pressure open flows are taken in the future, why; in all probability, the Railroad Commission will require that the shut-in pressure at the well head will be taken after the back pressure test has been taken, which means that there will have been a sizeable amount of gas produced before the well was closed in.

That pressure will be taken, probably, between 72 hours and 96 hours after the completion of the test.

By Mr. Littman:

Q. In other words, you are fearful that the next report of the Texas Railroad Commission will not bear out your rock pressure drop?

A. Not fearful, hopeful that it will not; but I just mention that it is not a comparative test with previous years.

Q. In other words, by "hopeful", you mean that you [fol. 5052] would be glad to learn that the life of the Panhandle Field would be in excess of the 15 years that you estimate?

A. Yes, sir, unless they lowered our retirement age.

* * * * *

Q. Now, the next step, as I understand it, was that you prepared certain pressure-trend charts for your operating areas, "A" to "G", inclusive? Is that correct?

A. Yes, sir, that is correct.

Mr. Littman: I would like to have marked for identification as Exhibit No. 136-(1) a chart entitled, "Panhandle Eastern Pipe Line Company Wells, Pressure Trends Group Area 'A'."

Trial Examiner: This chart may be so marked for identification.

(Exhibit No. 136-(1) Was Marked For Identification.)

Mr. Littman: I would, also, like to have marked for identification as Exhibits Nos. 136-(2) to 136-(10), inclusive, certain other charts of similar character and description as that which I read for Areas "A", "B", "C", "D", "E", "F" and "G".

Trial Examiner: Very well. We will mark the series for identification as Exhibit 136 with the sub-numbers, in parentheses, 1 to 10, both inclusive.

(Exhibits Nos. 136-(2) to 136-(10), Inclusive, Were Marked For Identification.)

[fol. 5053] By Mr. Littman:

Q. Are the charts, which have been marked for identification as Exhibits Nos. 136-(1) to 136-(10), inclusive, the pressure-trend charts for Areas "A," to "G", inclusive, to which you just referred?

A. With the exception of No. 5, which is a duplicate of Area "C", and it rightfully could be included. Yes, they are my idea of what the pressure will be, by years, as an average in each of the group areas in which we operate.

Q. Did you use all of these charts in arriving at your estimate of production in the Panhandle Field, which is shown in Exhibit 131 and, also, in Schedule 5 of Exhibit 43?

A. I used them as a basis for my estimate, and did not stick to them entirely, mathematically, because I went to round numbers and I also used some degree of judgment, based on experience, and did not show, as it was not possible to show, that there would be necessary additional horsepower required at certain times to maintain the level of production shown in Exhibit 131, as there were no capital expenditures shown after the 1946 year.

Mr. Littman: Will you please read back that answer?

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. You stated a few moments ago that Exhibit 136-(5) was an exception of some sort. Will you please amplify [fol. 5054] that statement?

A. Yes. It is all right. I saw this "revised" on here, and I thought it meant that the revised copy had been put in, in addition to the copy of the original, which was an error.

There was an error on the Group Area "D", due to the fact that a draftsman put "C" instead of "D" on it. I sent a replacement, and I thought you had not taken the originals out, so they are all right as is.

Q. And there are no exceptions? A. No.

I would like to call your attention to the fact that for Areas "A", "B", and "C", there are two pressure-trend

charts, one for the company wells and one for the purchase wells, but there are no purchase-well pressure trends for Areas "D", "E", "F" and "G".

That is due to the fact that "D", "E", "F" and "G" are areas of high permeability, and it is assumed that the pressure on the purchase wells will be the same as that on the company wells in these three highly permeable areas.

Q. Suppose we look at Exhibit 136-1) for a moment.

Now, this exhibit, which is a chart, shows the pressure trends for the company wells in Group Area "A", which area is shown in your Exhibit 46. Is that correct?

A. Yes, sir, that is correct.

[fol. 5055] Q. Now, am I correct in understanding that each of the lines drawn on the chart prior to 1941 represents an individual well? A. That is correct.

Q. Now, will you explain what those lines mean?

A. Those lines stand for the observed well head pressure at those wells during the midyear tests for each year, commencing in 1931 and ending in 1941.

Q. You are now referring to tests made by the company on its own wells?

A. Up to the 1935 test, and during that year all tests were made under the supervision of the Railroad Commission of Texas and have been, from that time to date.

Q. And those tests were made along about the middle of each year? A. Yes, sir.

Q. In other words, you plotted a point in each year for each test on each well, and then drew a line for each well?

A. Yes, sir, from pressure point to pressure point.

Q. Now, I note that some of these lines are rather inconsistent, in that they go down and then up and then down again from year to year, and look a little bit zig-zag.

Will you please explain that?

A. That curve in the year 1937, the only reason that I could advance for that extreme dip in pressure on the two [fol. 5056] wells which are shown, is the fact that the wells had not been closed in before the tests were taken and were probably producing on the line, and instead of waiting until there had been a 72-hour shut-in pressure, that the pressures were recorded immediately after the wells were taken off the line.

Q. Now, for those wells to which you have just pointed, the rock pressure in reading in 1938 was considerably higher than in 1937?

A. That is right. It would indicate that the pressure was observed immediately after they had been produced on the line, and that they were closed-in a normal length of time in 1938.

Mr. Culton: Do you recall which those two wells are?

The Witness: I was trying to make out the number, but it is so dim on here that I am unable to do so, but I can tell which two wells they were by looking at my pressure data, if you want me to.

By Mr. Littman:

Q. Well, I wasn't particularly interested in any two wells, Mr. Hinton.

A. There are two of the Burnett wells.

Q. Well, how long are these wells ordinarily shut-in before the rock pressure readings are taken?

A. The requirements in the Panhandle Field are now a minimum of 72 hours, with no maximum shut-in time.

[fol. 5057]. For the Hugoton Field, I took it upon myself this year to write the rules for testing, because I was Chairman of a Subcommittee on some tests being made in the fields, and they were accepted by some other producers.

We have a minimum of 72 hours in that field, and a maximum of 96, which gives us a 24-hour period to take pressures after they have been producing on the line at a normal rate for not less than six days previous to being shut-in.

Q. Now, what are the vertical calibrations on these charts?

A. They are merely the observed closed-in pressures of the wells, and are in pounds per square [in,] gage pressure.

Q. Now, the lines prior to 1941 that are shown in each of these charts in Exhibits 136-(1)- to (10), inclusive, represent actual rock pressure readings, do they not?

A. Yes, sir.

Q. And what do the lines shown on and after 1941 represent?

A. That is my idea of what the probable average closed-in well head pressure will be for the wells located in Group Area "A".

Q. In other words, that line represents your estimate of the average for all wells? A. That is correct.

Q. In that area? Is that right?

[fol. 5058] A. Yes, sir.

Q. Now, in each of these charts you have a single line running on and after 1941, and I believe you have already stated that that represents the average of all of the individual wells in that area?

A. It is an estimate of what the average pressure to be expected is.

Q. In other words, by looking at the chart, Exhibit No. 136-(1), for instance, in the year 1952, for example, you merely ascertain the point at which the estimated line crosses that year, and you take the reading shown on the chart by vertical calibrations, and that gives you the rock pressure which you will expect to be found in the area at that time?

A. That is correct.

Q. And what is the average on this particular chart?

A. 174.5 pounds.

Q. For 1952? A. Yes.

Q. Now, how did you draw this extrapolated line in Exhibit 136-(1), for instance, which covers the years from 1941 down through 1958?

A. You mean by "how did I draw it", what things did I give consideration to in the placing of this line upon the chart?

Q. I would like to have the steps used by you in plotting it.

First, Mr. Hinton, you might tell us why you started at the particular point that you did, which appears to be at 340 pounds rock pressure.

A. That happened to be the approximate average of the wells in that area at the midyear pressure observation for the year 1941.

In placing this estimated pressure-trend upon this chart, I first found out what was happening in the field by going back through the steps which we have gone through on Exhibits 133 and 135.

Q. Exhibit 133 reflects the data shown in Exhibit 135, does it not? A. Yes, that is right.

Q. So that, if you looked at Exhibit 133, that would give you the information that you desire? A. Yes.

Then, I made myself acquainted, as nearly as possible, with the type of wells which are prevalent in Group Area "A". I then made myself acquainted with the rate of withdrawal from that group area.

I next found out, as nearly as possible, how many remaining well locations there were in the group, and the next thing I did was to find out what the—not find out, because I knew, but I studied more closely the pressure [fol. 5060] condition in that area, and in the areas surrounding it.

By combining all of this information with the build-up pressure records of that area and the pull-down pressure records, I placed this pressure-trend decline curve upon the chart.

[fol. 5063] C. H. HINTON, a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Cross-Examination (Continued).

By Mr. Littman:

Q. At the close of yesterday's session, we were discussing the pressure-trend charts designated for identification as Exhibits Nos. 136-(1) to 136-(10), inclusive.

Trial Examiner: Do you have the pending question in mind, Mr. Hinton?

The Witness: No, sir.

Trial Examiner: There was an unanswered question.

By Mr. Littman:

Q. At the close of yesterday's hearing, I asked you to explain, step by step, the method used by you in drawing the curve on each of these charts which is projected beyond the 1940 and from the year 1941.

A. I believe that we have gone through the method used in placing the pressure line, the individual pressure line for each well from the date the well was drilled to the [fol. 5064] midyear test for 1941.

Now then, as to the matter of extending the pressure-trend curve on each group, there were many things that were taken into consideration.

The basic and perhaps the main thing, is the field performance, that is, of the total field. The past performance of the field has been extended as shown on Exhibit 133.

Q. May I interrupt to ask you whether you mean that you used the same general curve as that which is shown on Exhibit 133?

A. Not exactly the same curve, no, but the curve shown on Exhibit No. 133 is the controlling factor for the placing of the pressure curve of each of the group areas because, as the whole field goes, to a certain extent so must each group area follow.

In addition, it was necessary to weight carefully the amount of gas that is being withdrawn from each group area to take the formation into consideration from the standpoint of how fast it is indicated that gas flows through the formation in each of the group areas, and also what the probable effect of the withdrawal will be from areas adjoining each group area.

For example, in Group Area "A", you will note that the pressure line on Group Area "A" extends to about the middle of 1958.

Now, in placing that pressure line at that point, it was [fol. 5065] necessary to know that the general characteristic of the formation in Group Area "A" is what would be termed "tight" in comparison to the formation over in the Moore County area of the field.

Mr. Culton: Moore County would be, for instance, "E", "F" and "G"?

The Witness: Yes, principally "F" and "G".

Now, in the studying of the action of the gas through the formation and the flow, it was necessary to carry on

a long series of observations to determine just how long it takes to build up the pressure once a well has been blown to atmosphere, and we find that in Group Area "A", the length of time required for a well to regain its normal closed-in pressure is considerably longer than it is over in the Areas "F" and "G" and "E" and the west part of "B".

Therefore, there was consideration given to the things mentioned before the pressure line was extended, and it is not based on any pure mathematical calculation.

Trial Examiner: Mr. Hinton, in Group Area "A", you have embraced a part of the sour gas field, I believe?

The Witness: Just a little bit there to the northeast, because that actually governs the rate of withdrawal for the area northeast of our development.

Trial Examiner: The sour gas, I understand, is withdrawn without control.

[fol. 5066] The Witness: Sour gas is prorated, but the amount that is withdrawn, as a whole, is not controlled. It merely means that the total amount is divided between the wells which have been drilled in the sour gas area.

Mr. Culton: What the Examiner is getting at, I think, Mr. Hinton, is that the production from those sour gas wells is not limited to the volume of production that is actually taken ordinarily from the nearby sweet gas wells.

The Witness: That is correct.

Mr. Culton: They are limited in their production, but not to the small volumes that are really being taken from the sweet gas, is that right?

The Witness: That is right.

However, the rate of withdrawal from the wells located in the northeast part of Group Area "A" are not producing at the rate that the sour gas wells are producing in the northern part of Moore County.

Trial Examiner: That was the information I was about to ask, having noted that the sour gas area in your Group "A" is rather near the Town of Borger and quite close

to an extensive petroleum development, and I was about [the] ask whether or not they had carbon black plants in the Borger territory which were drawing heavily from this corner of your Group "A".

The Witness: There are several large carbon black plants at Borger, but they are not supplied entirely by [fol. 5067] the production in that area, because some of that gas is piped in from other portions of the sour gas area of the field.

Trial Examiner: The pressure map does show a pressure zone in the extreme northeast corner of your Group "A" running as low as 150 pounds.

The Witness: That is correct, sir, and if the formation in Group Area "A" had the same characteristic as the formation in "G" and "F", the estimated life of the Group Area "A" that would be placed upon it by me would be much shorter than it is.

Trial Examiner: You refer now to some difference in the permeability, or the ability of the gas to migrate in that area?

The Witness: Yes, permeability is the major factor.

However, I believe that the average total pay thickness in the Moore County section of the field, "E", "F" and "G", will average a greater thickness than the pay thickness in Group Area "A", but permeability is the controlling factor.

Trial Examiner: And that is greater than in some of the other areas?

The Witness: Yes, sir.

By Mr. Littman:

Q. Mr. Hinton, the curve that we have been discussing, which appears on each of the charts, Exhibit 136-(1) to Exhibit 136-(10), which we will hereafter refer to as the [fol. 5068] pressure trend charts, is a very important curve and was used by you directly for the purpose of estimating the amount of gas that will be withdrawn from the wells owned and controlled by Panhandle Eastern, is that right?

A. Yes, the pressure is the governing factor for the life of the fields for long-distance pipe lines.

Q. And you used these curves on the pressure-trend charts literally in determining the expected rock pressure in the future years, is that correct?

A. Yes, sir, that is correct.

Q. Now, do I understand [you] testimony to be that this important curve drawn on each of these pressure trends was not drawn from any mathematical formula?

A. That is correct.

Q. It is purely a judgment line?

A. A judgment that is weighted by every factor which should enter into the pressure-trend of each group area as nearly as it is possible for me to place that in the proper weight upon the curve.

Q. You stated a moment ago you gave great weight, in drawing these curves on the pressure-trend charts, to the curves appearing in Exhibit 133 which are designated as Curves "A", "B" and "C"?

A. That is correct.

Q. As a matter of fact, those curves very closely resemble each other, do they not?

A. Yes, they do.

Q. The curves shown in each of the pressure-trend charts?

A. That is right. We might say that that is the father and these are the children of the curve shown on 133.

Q. By "that is the father", you mean the curves shown in Exhibit 133 and the children you refer to as Exhibits 136-(1) to 136-(10), is that right?

A. That is right. In other words, as the average for the entire field goes, so will every portion of that field follow the average to a large extent.

Only the things which I have talked about will govern, in my opinion, how the trend will differ in each of the areas from the average of the total field.

Q. Well, do I understand that if you had applied the curves appearing on Exhibit No. 133 literally to each of the pressure-trend charts, Exhibits 136-(1) to 136-(10), you would have obtained, substantially, the same result as that obtained by using the curves which you did use on the latter charts?

A. No, there would have been quite a little difference there because, if I would have used the curve on Exhibit No. 133 without giving consideration to the other things, each group area would have been identical, and the purpose of laying out the group areas would have become useless because, if we were going to use the one curve, [fol. 5070] it would not make a great deal of difference if we were just going to apply the average of the field to this problem, rather than giving consideration to what is believed will actually happen in each of the group areas.

Q. Well, your starting point of the curve in 1941 would have been different for each of the areas, would it not?

A. Yes, that is correct. The arithmetical average of each of the group areas would have been different.

Q. Well, looking at Group Area "A", Exhibit No. 136 (1), will you point out how far you deviated from the curve used in Exhibit 133?

A. I have already said that I believe that the curve "C" on Exhibit 133 is based on withdrawal figures that are more likely to happen than the other two, "A" or "B".

Q. Now, "C" refers to Condition "C", sometime Condition 1, which reflects the increased production in the Panhandle Field by all operators therein?

A. No, sir, that is Condition No. 3, and is Lines 11, 12 and 13 on Exhibit 134.

Q. I thought that you testified that Condition "C" and Condition 3 were the same?

A. Yes, but you said Condition 1. I was referring to "C".

Q. I am sorry, I meant that Condition 3 and Condition [fol. 5071] C are synonymous. A. That is correct.

Q. And what is the Condition to which you refer when you use the letter "C"?

A. Do you mean that you want me to tell you what is going to happen under that Condition, or just merely identify it on the exhibit?

Q. Well, I mean to repeat what it means, generally.

A. Condition "C" gives consideration to an increased withdrawal by pipe line companies from the Panhandle Field, not only Panhandle Eastern's, but other major pipe lines taking gas from that field.

Q. And the line designated by the letter "C" on chart, Exhibit No. 133, reflects that condition, does it not?

A. Yes.

Q. Now, will you proceed?

A. The average for the field in 1941, as shown in this graph, is 314 pounds, approximately.

Mr. Culton: 314.10 is what Exhibit 134 shows, is that approximately right?

The Witness: Yes.

Now, if this same line would have been extended from the average of Group Area "A" at the point where the pressure was extended from 1941, there would have been a difference of 23 pounds, and if the same curve would have been placed upon Group Area "A" as the curve [fol. 5072] for "C", the length of life would have been extended beyond the point which is shown on Group Area "A".

By Mr. Littman:

Q. In other words, you would have had—

A. (Interposing) In other words, instead of coming down to 50 pounds well head pressure at approximately midyear, 1958, that would probably have run out in 1960, but now then, if I might show you, I will try to explain why I do not think that that will happen.

You will notice that in the—

Mr. Culton: (Interposing) You are now pointing on Exhibit 26, the rock pressure map?

The Witness: Yes, sir.

Mr. Culton: All right.

The Witness: Now, you will notice that group areas have been superimposed upon this rock pressure map.

Mr. Culton: That is on the Examiner's copy that you are pointing to?

The Witness: Yes, sir, in red pencil; and in the north-eastern corner of Group Area "A", you will note that there is an area between 200 and 150 pounds.

Naturally, the gas which is now in place in the portion of Group "A" in which we operate is going to flow to the [fol. 5073] area of lower pressure.

The type of market for which the gas is used to the northeast of Group Area "A" means that this pressure will continue to be pulled down lower than it is.

Therefore, there is going to be a migration of gas out of Group Area "A", just as there will be in any area where there is an area of low pressure adjoining the group area.

In addition to the rate of withdrawal per acre from Group Area "A", consideration has been given to this portion (indicating).

By Mr. Littman:

Q. And how much consideration, and how did you arrive at that amount?

A. The amount of consideration which has been given to the conditions mentioned is reflected on Exhibit 136-(1), and it would not be possible for me to say as to what percent or any certain amount that has been placed upon that.

I have just placed that upon there to the best of my ability, feeling that I have given proper consideration to the things which are involved in determining the future pressure of these group areas.

Q. In each of the Areas, did you shorten the life as you did in Group Area "A" from that which is indicated by the Curve "C" on Exhibit 133? A. No.

Turning over to the pressure-trend curve for Group [fol. 5074] Area "B" you will notice that the estimated time that the pressure will decline at the well head to 50 pounds is about midyear, 1960.

Q. Well, Mr. Hinton, isn't that clearly the result of your starting point in 1940, rather than the result of a difference in the curvature of the curve?

A. It absolutely is not.

Q. Looking at your curve in Exhibit No. 136-(3), for Group Area "B"; it certainly appears by eye to be even

a sharper curve and a more sharply ascending curve than that shown in Exhibit No. 133. Am I right?

A. Yes, it is a more sharply ascending curve, because the line to the west of Group Area "B", you will notice—I am sorry, I cannot point it out to you—but Canadian River Gas Company has large holdings of acreage—

Mr. Culton: (Interposing) Can you point out the general location of that acreage on one of the maps?

The Witness: It might be termed as the extreme southern portion of Moore County and the Northern part of Potter County down to the fault line, south fault line.

Now, Canadian River has this tremendous undeveloped portion of acreage and whereas it is shown to have pressure above 400 pounds at this time, it is going to be surprising what will happen when that Canadian River acreage is drilled, because all through the years, as this gas has been taken out, each time that the pressure in the developed portion of the field has been lowered one [fol. 5075] pound or any number of pounds, there has been a migration of this gas and there is a pressure gradient from this undeveloped acreage over to the developed acreage.

Now, just as soon as Canadian River is forced to go in there and develop that acreage, there is going to be one of the sharpest pressure declines that has ever been experienced in that field, and as soon as that pressure goes down, then this pressure which is holding up the pressure in our area "B" at the present time is going to be lowered.

We will no longer receive benefit from migratory gas from the west, and there will be a sharp pressure decline.

Trial Examiner: Before you leave that, would you like to refer to Mr. Smith's cross-section, Exhibit 22, in that connection?

Mr. Littman: No, I would not, if your Honor please.

I understand the testimony to be that that cross-section was not an actual cross-section but—

The Witness: (Interposing) It shows the picture all right, however.

Mr. Littman: That is a little bit beside—

Mr. Culton: (Interposing) I do not think the statement is exactly accurate. It was that the wells are not actual wells, that the wells are only typical wells.

The cross-section, he stated, was correct.

Mr. Littman: My recollection of the testimony is very [fol. 5076] distinct, that that was not an actual cross-section, but was purely a typical cross-section.

Mr. Culton: You are mistaken on that. It was the wells that were typical. He specifically pointed out on the map where that cross-section went.

Mr. Littman: Of course, the record will speak for itself, but at this time I would like to interrogate Mr. Hinton about this curve, and if he wishes to go into further details and data, you can do it on redirect examination.

Mr. Culton: We will do it on redirect examination.

Mr. Littman: And I think that we will save time.

By Mr. Littman:

Q. Now, Mr. Hinton, if my eyes do not deceive me, certainly the curve—now, I am speaking of the curve in Exhibit 136 (3)—is not substantially different from the curve shown in Exhibit 133.

If anything, the curve in Exhibit 136 (3) descends more sharply than that shown in Exhibit No. 133. Am I correct?

A. You are correct, and for the reason just explained.

Q. Now, you start in Exhibit No. 136 (3) in the year 1940, you start your curve at approximately 375 pounds of rock pressure, do you not?

A. About 378.

Q. Yes, whereas the curve in Exhibit No. 133 starts in that year at about what point?

[fol. 5077] A. 308.6 pounds.

Q. And doesn't that account for your having an end point in the year 1960, approximately, of 50 pounds rock pressure in Exhibit 136 (3), as compared with an end point in approximately the year 1956 or 1957 for your curve "C" in Exhibit No. 133?

A. Naturally, the starting pressure governs the ending pressure, but if the same curvature were to be placed upon 136-(3) as is shown on Exhibit 133 by Curve "C", it would extend far beyond 1960.

Q. Well, then, I understand that in this instance, namely, Group Area "B", the effect of your changing and deviating from the line drawn, or curve drawn, in Exhibit No. 133 has the effect of shortening the indicated life, is that right?

A. Of the group area.

Q. Of the groups in Group Area "B".

Mr. Culton: Shortening from what?

Mr. Littman: Well, bringing about a decline to 50 pounds rock pressure sooner than you would have secured it had you used the curve shown in Exhibit No. 133.

The Witness: That is absolutely right, but it would not be placed in the right manner if that would be followed.

By Mr. Littman:

Q. I do not understand that.

A. All right. Suppose that we placed—take the curve shown, Curve "C" on Exhibit 133, and place it right under [fol. 5078] the Exhibit No. 136-(3) and then extend the same curve on Exhibit 136-(3) as shown by Curve "C" on Exhibit 133.

We would end up by having an area out here (indicating) to itself that would be many pounds higher than the average of the field, and regardless of what we would like, it is impossible for any operator to hold the amount of gas which was in place under any lease and the amount of gas that is actually to be taken is governed by the withdrawal of the whole field.

Therefore, it would be impossible to take this area in this high-pressure area and have it standing out there all by itself with low pressure all around it because, as the pressure is lowered in the area surrounding Group Area "B", then the pressure in Group Area "B" is going to come down sharply.

Q. Perhaps we can get at your method this way. You have already testified that the curve "C" shown in Exhibit

No. 133 was the controlling factor in your method of arriving at the curve to be used on the pressure-trend chart, is that right?

A. That is correct.

Q. Now, your deviations from the Curve "C" to which you have just referred, were not very substantial, were they, one way or another?

A. I would say that there was considerable deviation, because if we turn through the Exhibits, from Exhibit [fol. 5079] 136 (1) to (10), we will find that we have a variation.

You will note that on 136 (2), that the estimated length of time, or period when the well head pressure will become 50 pounds on the gas purchase wells located in Group Area "A" is 1953.

Turning to Exhibit 136 (3), you will notice that it is in 1960 that this pressure will be reached, and I would say that seven years was considerable deviation from the average.

Q. Well, was that due to the difference in the starting point of those curves, or was it due to the difference in the curvature of those curves?

A. Both.

Q. Well, now, how did you give effect to the change in the curvature of the curve? How did you arrive at anything like that? Did you do it mathematically?

A. Not only from the application of a constant, which has been established by past field performance, the deviation from the curve that was thus produced is largely a judgment figure with weight given to every controlling factor that could be thought of.

Q. But I cannot understand how you arrived at how much weight was to be given, one way or the other, to these multitudinous considerations that you say you considered.

A. Mr. Littman, I think that a gas field is a lot like law. You have to work with it a long time before you know [fol. 5080] just exactly how to proceed, and it is one of those things that you cannot just exactly lay your finger on, but it is one of those things that you know should be applied.

Q. Mr. Hinton, let me get at what I have in mind this way.

You knew where to begin to draw each of the curves in the group for each group area on each of the pressure-trend charts, did you not?

A. Yes.

Q. By taking the average rock pressure as of 1940 or 1941? A. Yes.

Q. Now, you knew where the end point was going to be, did you, that is, the bottom point of the curve?

A. Not until such time as I had studied all of these factors.

Q. You must have set the end point before you started to draw the curve, is that correct?

A. No, you do not draw a curve like that, Mr. Littman.

Q. How did you draw this curve, kind of free-hand?

A. A free-hand curve, and it is a judgment figure curve.

Q. Let's go back to the beginning point of each of these curves that you drew in the pressure-trend charts:

Now, how did you go about finding the first point through [fol. 5081] which the curve runs?

A. I added up the current well head pressures and divided by the number of wells on which the pressures were observed.

Q. And what was the next point that you selected, and how did you select it?

A. I found out what had been happening in the past and what would probably happen in the future. That is, as to the number of remaining locations that had not been drilled.

I took the total acreage in each group area and found out what number of undeveloped acres remained. I divided that by 640 acres, assuming that there would be one well drilled to each section of land, and I found out that there would be a certain number of remaining locations, and that the rate of withdrawal would probably be increased from that area.

Q. Let's take Group Area "A", which is Exhibit 136-(1).

Now, show us the first point that you plotted to draw the curve?

A. I did not plot.

Q. Well, the first point that you used or established.

A. All right. I took a triangle and I ran it up through the general trend of what had been happening on all of these wells in this group area, and I started the extension of my curve from that point.

Then keeping in mind all the time, as this marginal acre-[fol. 5082] age is drilled, the so-called weighted average is going to come down quite sharply because as soon as the thin acreage is drilled, the pressure decline on that is going to be much more rapid than it has been on the thick pay portion of the field, and as that comes down, that is going to accelerate, tend to help to accelerate this curve, and from that point on, I kept the other things under consideration.

You will notice down here, along about 1955, '54, that I assumed that there would be a sharp decline in the total amount of gas that would be withdrawn from this area, and for that reason, the curve straightens out down at this point.

Q. Now, when you started to draw this curve, you drew it at a point indicating the average rock pressure in 1941?

A. Yes, sir.

Q. Now, what was that figure?

A. That was approximately 340 pounds.

Q. All right.

Now, in 1942, what rock pressure is indicated?

A. 329, approximately.

Q. How did you arrive at the 329?

A. By following out what had been happening through the years of a comparable withdrawal rate.

In other words, if I could have a straight-edge triangle—you will notice that that line could have taken many different [fol. 5083] ent slopes, that is, it could have been flat, or it could have been very sharp.

Q. You are now referring to the lines prior to 1941, showing the past rock pressure readings of the wells?

A. Yes, for individual wells.

Q. They zig-zag in almost every direction, is that right?

A. Well, no, there is a general trend, and that trend is downward; and if you will go back to 1931, you will find that it is a much greater slope than if we go over to '40, '41, and the '40-'41 is not following the slope that was previously established by that group of wells from 1938 to 1940, and I mentioned that yesterday, that the shut-in pressure for the period observed in 1941 was of considerably greater length than the shut-in period for the previous years.

Therefore, I just used my judgment to give the curvature that I did to this curve.

Q. Now, Mr. Hinton—pardon me, had you finished your answer?

A. Yes, go ahead, I am sorry.

Q. Now, if 100 engineers looked at all of those varying and criss-crossing lines shown in Exhibit No. 133-(1), for instance, and had undertaken to do this job of drawing from those data a free-hand curve down through the chart beyond 1941, in all probability, you would have had 100 different curves, is that right?

[fol. 5084] A. And—

Q. (Interposing) Is that—

A. (Continuing)—and the value—

Q. (Interposing). Is that right?

A. Yes, that is right, and the value of the curve would have to be based upon the knowledge that engineer had of the subject.

Q. Well, 100 engineers would, in all probability, interpret the historical data of the rock pressure of these wells prior to 1941 in 100 different ways, is that right?

A. And if they did, and carried out their calculations in an accurate, normal manner, the result obtained by the 100 engineers would be very close to the same.

There would be variation, I will grant you that, but the total percent of variation would necessarily have to be small if they knew what they were talking about.

Q. Then, in the final analysis, these important curves that you applied literally for the purpose of estimating the rock pressure for each year in the future, and upon which you based and predicated the production of the Pan-

handle Eastern work in the future, was purely a matter of judgment?

A. And knowledge of the subject.

Q. And it was not based at all upon any mathematical formula?

A. No, no straight mathematical formula, a great deal [fol. 5085] of mathematics, but no formula.

Q. And these important curves appearing in each Exhibit 136 (1) to 136 (10), inclusive, from and after 1941, were plotted free-hand by you from your general knowledge and judgment?

A. Knowing—

Q. (Interposing) Is that right?

A. That is right.

Q. You see, when you nod your head, the record does not show—

A. I will try to cut out nodding.

Q. Your answer was "yes", and you were going to explain further?

A. And I just wanted to mention that these curves are always going to be available for the management to look at and for me to receive criticism from.

Q. Now, am I correct in understanding that you did not plot any points along the field from which you drew the curve, I mean the field of the chart?

A. Your question, I believe, is, were any dots placed upon the chart that had mathematical significance?

Q. Well, either physical points, or mental points, did you plot the curve through certain points on the chart?

A. Mental points, yes, every fractional part of the way; physical, no.

[fol. 5086] Q. How did you get at the precise figure through which you drew your curve in the first instance on Group Area 1-A2, No. 136 (1)?

A. To what precise figure do you refer?

Q. I am referring to 1942. A. 1942—

Q. (Interposing) Was that your second point?

A. That was not a point at all. It was just merely a line.

Q. Well, you say you knew your starting point.

A. Yes, sir.

Q. What was your next point, if any?

A. The curve passes through a point at midyear, 1942, which is at approximately 329 pounds pressure.

Q. Now, if you had continued that point straight ahead, you would have had a straight line, would you not?

A. Naturally.

Q. All right. Now, how did you determine the curvature of the curve?

A. Well, I first figured the number of square miles in the group area. I obtained a knowledge of the formation by well performance. I gave consideration to the total withdrawal from the field. I gave consideration to the withdrawal from areas surrounding this particular group area.

I studied the acreage situation, found out how many re-[fol. 5087] maining locations there were to be drilled. All of those things which I have previously mentioned were taken into consideration.

Q. Am I correct in understanding that this is not, strictly speaking, an engineering curve?

A. No, it is not.

Q. You say it is not?

A. No, if you mean by an engineering curve, does it have the same degree of curvature throughout or is it a simple or complex or a compound curve, it is not.

Q. Is it a plotted curve?

A. It is a drawn curve.

Q. But not plotted through various points arrived at by you on the chart?

A. Not physical points, no, sir.

Q. When did you reach the point at which your curve strikes the bottom of the chart? Was that the last step, or was that one of the early steps?

A. That was the last step.

Q. And you reached that point simply because the arc of your curve results in the curve falling at that point?

A. That is right, with due consideration given to the rate of withdrawal.

Mr. Culton: Let me ask a question. Is that a uniform degree in the arc?

[fol. 5088] The Witness: No.

Mr. Culton: So it really is not an arc, is it?

The Witness: Well, probably strictly and technically speaking, it is not.

By Mr. Littman:

Q. I regret, Mr. Hinton, that I am thus far unable to understand how you drew this curve. I wonder whether you would try once more and start with the beginning of the curve on Exhibit No. 136 (1), and trace, step by step, what you did and what you thought about in doing it.

A. The first step in making the curve shown on 136 (1) for Group Area "A", was to plot annual observed pressures of all wells connected to the system of the Panhandle Eastern Pipe Line, and they were plotted up through the year 1941, that being the last data obtainable.

Q. Those are the company wells only, are they not?

A. That is correct. This refers to company wells only.

I then found out that there were certain amounts of acreage held by various companies in that area.

Q. What amounts?

A. I found out that the Panhandle Eastern had 10,200 acres, approximately; that the Cities Service Gas Company had 39,800 acres; Phillips, 1,600 acres; and Canadian River, 10,550; and the rest owned by various others.

Q. How much by the various others, as a group?

[fol. 5089] A. 12,850 acres.

Q. Making a total of how many acres?

A. 75,000, approximately.

I then found out that in 1935 there had been 80 wells drilled on that group area. I found out that there had been 5 [addition] wells drilled by 1936; 10 additional wells drilled by 1937; one in 1938; one in 1939; and 2 in 1940; which indicated that the rate of development was very slow in that particular area.

It can be noted on Exhibit 136 (1) that the pressure line for Well No. 1 and No. 7 fall considerably below the average of the wells in that group area. Naturally, that caused me to give consideration to the lower pressure areas to the northeast; so, after I [find] who owns the wells and what the rate of development has been, what the rate of withdrawal is and what the field performance in that

particular portion of the field had been, it gives me a very, very good idea on how to go ahead and extend this pressure curve, knowing in the back of my mind how the pressure performance for the field, as a whole, is going to be.

Q. All right.

Now, up to that point, you have certain information.

A. Yes.

Q. Then, did you start to draw the curve? A. Yes.

[fol. 5090] Q. And you had a starting point, did you not, in 1941? A. Yes.

Q. Now, will you state that point again?

A. That is 340 pounds, approximately.

Q. 340 pounds? A. Yes.

Q. Of rock pressure which represents the average pressure of the wells in Area "A"? A. 15 wells.

Q. Now, proceed to draw the curve for us from there, and tell us how you drew it, step by step, please.

A. All right.

As I have already mentioned, the basis of the extension of the curve is past performance, and past performance weighted with an estimated future rate of withdrawal really comes right down to the point where you know then, by the next year, that the pressure decline is going to be a little bit greater than it was before and you will notice—

Q. (Interposing) How much greater?

A. Approximately 1.141, I believe, is the figure, but it is not applied—

Q. (Interposing) What is that, 1.141 pounds?

A. Yes.

[fol. 5091] Q. Per year? A. Per trillion.

Q. Per trillion? A. Yes.

Q. That is the rate of decline that you used?

A. No, that is the rate of the decline that should be added to the previous declines and that applies to the whole field.

Now, then, I believe that I have gone into sufficient detail to explain how each of these things are given consideration on the extension of this curve, and I told you two or three times that it is not a mathematical curve, and by

you asking me to go ahead and extend this curve, I again say that I applied my judgment as governed by the performance of the field as a whole.

Q. You have not told us how much weight you applied to each element you say you took into consideration, Mr. Hinton.

A. No, and I could not tell you, Mr. Littman, because it is not that kind of a curve. It is not that I put in so much salt and so much sugar. It is a combination of all those things and it varies as to each group area, or we would not have outlined the group areas on the field.

Q. You stated a while ago that you set your triangle through the past experience, is that right?

A. That is right. It is necessary that the individual performance of each well be studied.

[fol. 5092] Q. What is the definition of the slope that you used in pressure decline, in pressure decline per year?

A. I would say that it is a judgment curve.

Q. How much in pounds per year?

A. It is not a constant in pounds decline per year.

Q. Well, now, if you set your triangle, as you say you did, there was a slope, was there not? A. Right.

Q. What was that slope?

A. Do you have a protractor handy? I will be glad to measure the slope for you.

Q. Well, can't you tell us without a protractor what the measurement is of your slope in pounds decline per year?

A. If you wanted it in pounds decline, yes, sir.

Q. Yes.

A. I thought you meant the angle with the horizontal of this curve, that is what I thought you had in mind.

Now, you want that, year by year, do you?

Q. Just at the beginning point of your single curve in 1941.

A. There would be none just at the beginning point, unless you would extend it on to some period.

Q. Well, the slope extends from the beginning point, [fol. 5093] does it not?

A. Yes, sir, for one year. Do you mean for the next year, Mr. Littman?

Q. Well, you were speaking of the slope that you just developed. Now, what rock pressure decline do you show for the first year? A. 11 pounds.

Q. And that would be from 1941 to 1942, wouldn't it?

A. Yes, sir.

Q. What do you show for the next year?

A. Approximately 12 pounds.

Q. Now, what is it for the next year, which would take you to 1944?

A. Midyear pressure, 1944, is estimated to be 310 pounds.

Q. What is the rock pressure decline in that year?

A. Slightly over 12 pounds.

Q. What is it for the next year, that is, to the middle of 1945?

A. Approximately 13 pounds.

Q. Now, let's go back.

How did you determine that there would be an 11-pound drop between 1941 and 1942 in rock pressure?

A. By the application (of past field performance and judgment.

[fol. 5094] Q. Did you do that, year by year?

A. Oh, yes.

Q. And, having determined the pressure drop for each year by your judgment, you then drew the curve accordingly? A. Yes, sir.

Q. Now, does that explain the method of drawing the curve, that is, the ascertainment by you of the drop each year in rock pressure decline, according to judgment, for the areas?

A. I believe I so testified, from the beginning, that it was a judgment curve.

Q. Well, Mr. Hinton, we are earnestly endeavoring to understand your method, and this latter testimony may be the touchstone to clearing us up, and I want to make certain we understand you.

You started, as you said a minute ago, with the 340-pound pressure reading for all of the wells in Group Area "A" in 1940. Is that right?

A. That is right. That is the arithmetical average of the 15 wells located in that group area.

Q. And the next thing you did was to determine how much decline there would be in the rock pressure in the succeeding year or throughout the succeeding year?

A. That is correct.

Q. And you arrived at that, not by a mathematical formula or any mathematical calculations, but purely by your judgment of the matters which you have already enumerated?

[fol. 5095] A. With the field performance of the total field as a guiding factor, to some extent, in all cases.

Q. And that guiding star, so to speak, was the curve that was designated as Curve "C" in Exhibit No. 133?

A. Yes, sir. I felt that the relationship of each group area to the whole field would be as is expressed on this series of judgment curves from 136 (1) to 136 (10).

Q. You concluded, with respect to Group Area "A", Exhibit 136 (1), that by the middle of 1942 the wells would have suffered a decline in rock pressure of 11 pounds? A. That is correct.

Q. From the previous year?

A. Yes, sir.

Q. Now, what decline would have resulted had you literally applied the rate of decline developed from your curve designated as Curve "C" in Exhibit No. 133?

Mr. Culton: You are speaking now from 1941 to 1942?

Mr. Littman: Yes, the figure that would be comparable to the 11-pound drop.

The Witness: About $12\frac{1}{2}$ pounds.

By Mr. Littman:

Q. You had the $12\frac{1}{2}$ pounds in mind when you worked on chart, Exhibit No. 136 (1), did you not?

A. That is right.

Q. And you concluded to use 11 pounds of drop in [fol. 5096] pressure for that year, rather than $12\frac{1}{2}$, did you not?

A. In that particular group area, I did.

Q. Now, if you will explain to us why you used 11 instead of $12\frac{1}{2}$, it might further help to clarify your method.

A. The reason the 11 pounds was used was due to the fact that the permeability in the portion of the group

area in which we have our development is low, and the rate of travel through this gas is likewise slow.

Therefore, I did not feel that we would suffer a great deal of drainage to the area to the east because, even though there is a greater pressure gradient from our development to the northeast than there is from our development to the west, the other way, the ratio on the difference of squares on the two areas of pressure indicated to me the flow of gas would be about the same and what went into the lower-pressure area would be compensated by what came in from the higher-pressure area.

Mr. Calton: Point out on the map where those higher-pressure areas that would feed into your wells are located.

The Witness: To the west and southwest and south also.

By Mr. Littman:

Q. Well, now, why didn't you conclude that 11½ pounds would be the right figure to use, rather than 11 pounds?

A. Well, now, if you are going to get down to quarter-pounds, why, then you are going beyond what I feel would [fol. 5097] be anything that would be close to a judgment figure, because a judgment figure has more deviation than a quarter-pound.

Q. Well, I just wondered how you arrived precisely at 11 pounds from the original 12½-pound figure, and I take it by your answer that it is purely a matter of judgment?

A. That is right, and that could have been 11.3 or 10.64 and it would still be in the realm of what I consider good judgment.

Q. Why, for instance, didn't you arrive at 10 pounds instead of 11 pounds?

A. Because I did not think it would be right.

Q. As a matter of general judgment?

A. As a matter of general judgment, and I ask you to come and observe the past performance of these wells, and you will see why it will not be right.

[fol. 5098] By Mr. Littman:

Q. Now, for the period representing a year from the middle of 1942 to the middle of 1943, I believe you stated

you estimated that the wells in Group Area "A", belonging to Panhandle Eastern Pipe Line Company, would decline 12 pounds in rock pressure. Is that correct?

A. That is correct.

Q. And having found that to be the fact, according to your judgment, you then projected your curve on through that point on chart, Exhibit 136-(F)?

A. That is right. However, I would say that I did not know that that was going to be 12 pounds until after I had projected that curve.

Q. Well, how did you project the curve from the middle of 1942 to the middle of 1943, without knowing where it was going to fall?

A. I merely observed the past performance of all wells and extended the indicated future performance by placing a triangle on the past performance and extending it, giving consideration to the increased decline that I thought would be felt in that area for that period.

Q. Now, is that all that you can tell us about how you extended the curve?

A. No, sir. I can repeat from all the things that one has to keep in mind as this extension of the pressure [fol. 5099] curve is made.

Q. Well, it looks like we are right back where we started from, Mr. Hinton. I understood you to say just before the recess that you determined, by judgment, the amount of decline to be expected in each year, and then plotted your curve through the point indicated.

A. That is true when the curve reached a point several years in advance of the data which is now on record.

Q. Well, of course, the years that we are speaking of are the future years.

A. That is correct, but it is a simple problem to extend a curve into the future for the next two or three years. It is at the point ten years beyond the present where it is difficult.

Q. Well, suppose you tell us how you projected your curve ten years into the future, which would bring you to 1950?

A. When the 1950 period is reached, the group areas will be acting, each of them, very much like the field as a whole, because at that time there will be but very little undeveloped acreage in the Panhandle Field, and

the withdrawal will, therefore, be spread over the entire field instead of in concentrated areas of the field.

Q. And, on and after 1950 you then applied, literally, the curve designated as Curve "C" in exhibit 133?

[fol. 5100] A. By "literally", you mean with some degree of cut and fill, or do you mean that it is exactly a reproduction of the curve shown on Exhibit 133?

Q. Well, suppose you tell us the extent to which you gave weight to the curve in the chart, Exhibit No. 133, on and after 1950.

A. I couldn't express that in percentage. I would say that considerable weight was given to it, because the whole field at that time is going to be acting about the same, although there will be variations, due to permeability and increased withdrawal from certain portions of the field.

We must remember that in the East Field at the present time there is considerable production obtained, but when we reach the 1950 period, it is quite probable that there will be very little remaining production in the East Field.

Now, the companies which are now obtaining production from the East Field will have moved their withdrawal from the East Field over to the West Field, and the total amount of gas will be coming from a smaller reservoir than it now comes.

Q. Well, how much weight would you say you gave to the Curve "C" in Exhibit 133 on and after 1950? Would you say you gave it approximately 90 percent weight, 75 percent weight, or what?

A. I would say that I gave it considerable weight.

Q. But you can't express, even in percentage, how much weight?

[fol. 5101] A. No, because the percentage varies to a certain extent in each of the group areas.

Q. What is the average pressure decline for the past five years on company wells in Area "A"?

Mr. Culton: Do you mean annually, or on a basis of production?

Mr. Littman: Annually.

The Witness: Approximately 40 pounds.

By Mr. Littman:

Q. Per year?

A. No, for the last five years. That is what your question was, I believe.

Q. Now, that would be an average of about 8 pounds' drop per year?

A. That is right.

Q. Now, will you give us the same figure for each of the charts and areas, designated for identification as Exhibits 136-(1) to 136-(10), inclusive? You have given us 136-(1).

Now, suppose you go to the next chart.

A. All right. I think it only fair to explain to you here that, without giving consideration to the rate of withdrawal for those five years, you might get an idea that would not be correct, because the rate of withdrawal from most of these areas was much lighter five years ago than it is today.

[fol. 5102] Mr. Culton: What is Page 2? Group "B"?

The Witness: No, Page 2 is the gas purchase wells located in the group areas.

By Mr. Littman:

Q. Exhibit 136-(2)? A. Yes, sir.

Mr. Wheat: That is located in Group Area "A"?

The Witness: Yes.

I don't have those averaged for five years for the period commencing in 1935, but the decline has been, I would say, approximately, 25 pounds, that being from an average pressure of approximately 251 pounds down to an average pressure of 226 pounds.

By Mr. Littman:

Q. All right, will you give us the figure for the next one. Incidentally, is that the figure per year?

A. No, that is for the—

Q. (Interposing) For the five years?

A. For the five years, and the rate of production has been quite high from those wells, and from that particu-

lar area. I want to call your attention to the fact that there was only a drop of 25 pounds for this same comparative rate of production, due to the fact that these wells have been fed by migratory gas, and as soon as the pressure is lowered in the rest of the field where it [fol. 5103] is no longer possible for this gas to migrate into this area, these wells will decline very sharply, as is beginning to be felt or shown during the past year.

Q. Now, that average is five pounds per year?

A. Five pounds per year.

Mr. Culton: By the way, is it true or not that, in that area, the gas purchase wells have lesser pressure than the company-owned wells?

The Witness: Yes, sir.

Mr. Culton: And the higher-pressure wells are suffering the greatest decline in pressure per annum in that area?

The Witness: Yes, generally speaking, that is correct. The Chapman Well, which is owned by the Huber Petroleum Corporation, has a pressure which could be compared to the average pressure of our 15 wells in that area.

At the same time, we have two wells, Burnett 1-108 and Burnett 1-119, that are considerably lower than the average.

Mr. Culton: But speaking as a rule, your higher-pressure wells have suffered the greatest decline in pressure?

The Witness: Naturally.

Now, on Exhibit 136-(3), the average pressure in 1935 was 417 pounds; in 1941, the average pressure was 371 pounds.

By Mr. Littman:

Q. You better go back and start from the beginning [fol. 5104] and state the six-year drop and the average for the six years.

A. You asked for five years, and I went back to 1936. The pressures which I have given you for 136-(1) are for the five-year period, starting midyear 1936 to midyear 1941.

Q. Just so that you are consistent throughout with either the five years or the six years.

A. Yes, it is my error.

Q. Now, we have the five-year period for Exhibit 136-

(1). Now, what do we have for Exhibit 136-(2)?

A. The pressure drop is approximately the same, because from 1935, the point previously given, to 1936, many of those wells were curtailed in production if the rate at which they had been producing showed a pressure increase, so, although it is not averaged, I don't believe it would be one pound different.

Q. You mean the same as you had given a moment ago, or the same as those on the previous chart?

A. Yes, that being approximately 250 pounds, and that is for the midyear period 1936, down to 226 for the midyear 1941.

Q. What is the total drop for the five years?

A. 24 pounds.

Q. And the average would be 4.8 pounds per year?

A. Yes.

Now, for Exhibit 136-(3)—

[fol. 5105] Mr. Wheat: What area is that?

The Witness: That is the company wells located in Group Area "B".

The pressure, midyear, for 1936 was 411 pounds, and the average at the midyear test, 1941, was 378 pounds, a drop of 33 pounds for the five-year period.

By Mr. Littman:

Q. That is an average of how many per year?

A. 6.6 pounds per year.

Q. Now, will you continue through the exhibit?

A. Yes, sir. I will try to hurry a little more, too.

For Exhibit 136-(4), showing gas purchase wells located in Group Area "B", the midyear pressure, at 1936, average was approximately 402 pounds, and midyear 1941, for the same group of wells, the pressure was 363 pounds, both of those being approximate figures, or an average of 7.8 pounds per year.

Q. And 39 pounds over the five years?

A. Yes, sir.

For Exhibit 136-(5), showing the company wells located in Group Area "C", in 1936 the pressure average for those wells was 347 pounds. In the year 1941 the average pressure was 318, a total of 29 pounds drop, 5.8 pounds average for the five-year period per year.

The gas purchase wells, located in Group Area "C", [fol. 5106] have not been averaged, other than for 1941. I can give you very close to an approximate figure on that. It is from approximately 340 pounds, about 325 pounds for the midyear period 1936, and 289 for the midyear period 1941, being a drop of 36 pounds or 7.2 pounds average per year.

The pressures for Exhibit 136-(7), showing company wells located in Group Area "D", there were no wells drilled in this area in 1935. The first well on which we have a pressure was drilled in the first part of 1936 and came in at a pressure of 397 pounds. The present average pressure for that group of wells is 343 pounds, a total drop of 54 pounds, or 10.4 pounds per year.

Mr. Wheat: '10.8; isn't it?

The Witness: Yes, 10.8.

The exhibits 136-(8), (9) and (10), although they carry the title of the company wells, the extension of the pressure curve will apply to both the company and purchase wells, inasmuch as that is a highly permeable area, and the pressures will have a tendency to equalize on all wells located in those areas.

The average pressure for the company wells located in Group Area "E" for 1936 was 412 pounds. The average pressure for the wells located in Group Area "E" for 1941 was 358 pounds, a total drop of 54 pounds and an average of 10.8 pounds per year.

[fol. 5107] By Mr. Littman:

Q. Did you give the figures for the gas wells of Panhandle Eastern's vendors in Group Area "D"?

A. No, that same situation applies to "D", which is the area located to the west of the Speed compressor station. In that area there, the wells are located fairly close together and, I think, we can safely apply the pressure-

trend curve shown on "D" for the company wells to gas purchase wells.

Q. You did so apply the data, did you not?

A. Yes.

Mr. Culton: That is true as to "D", "E", "F" and "G"?

The Witness: Yes.

By Mr. Littman:

Q. In other words, you are not going to give us any separate figure for the gas vendor wells for those areas?

A. No.

Q. Very well.

A. Exhibit 136 (9), the average pressure for the wells in that group—

Mr. Wheat: (Interposing) What is that group?

The Witness: That is for the company wells located in Group Area "F".

The average pressure for those wells in 1936 was 408 pounds. The average pressure of the group of wells located in that area in 1941 was 356 pounds, a drop of 52 [50.8] pounds, or 10.4 pounds per year.

The wells shown on Exhibit 136 (10), which is the pressure trend for company wells located in Group Area "G", had an average pressure at the mid-year test of 1936 of 405 pounds.

The average for the same wells in 1941 was 354 pounds, a drop of 51 pounds for the five years, or an average of 10.2 pounds per year.

I am glad that you had me go through these, because I believe now that you can see that there is a tendency for a sharper drop in the areas by going through them that you might not have observed without doing so.

By Mr. Littman:

Q. You mean a sharper drop than what?

A. Than you perhaps had in mind, because I have noticed several times that you have talked about extending the same pressure curve that was obtained through the earlier years of the field.

Q. A while ago you referred to two low-pressure wells in Area "A". Will you give us the location of those two wells and their names?

A. Yes, sir.

The first well mentioned is the Burnett 1-108, which is located in the south half of the southwest quarter of Section 108, Block 5, I. G. and N. R. R. Company Survey.

The other well mentioned is located in approximately the [fol. 5109] center of the southwest quarter of Section 119, Block 5, I. G. and N. R. R. Company Survey, both in Carson County, Texas.

Mr. Culton: Those are both near the north line of Area "A"?

The Witness: That is right, although there is a surprisingly small distance between these low-pressure wells and our wells which carry considerably higher pressure which, again, points to the low permeability of that section.

Mr. Culton: There isn't good feeding into those wells, in other words?

The Witness: From areas of higher pressure, that is correct.

By Mr. Littman:

Q. Now, Mr. Hinton, I note that each of the lines in your Exhibits E36-(1) to (10), over at the extreme left corner of each of these charts, is designated by a number. What do those numbers represent?

A. Those are identification numbers which were placed upon there so a reference could be made to the observed pressures for any year for any well.

Q. How could we identify any of these wells from those numbers, for instance?

A. By stating the summary of the group areas and—

Q. (Interposing) In your working papers?

[fol. 5110]. A. In my working papers.

Mr. Culton: That is the key to your working papers, in other words?

The Witness: Oh, yes.

By Mr. Littman:

Q. It is not the key to the map, Exhibit No. 46, is it?

A. When you say "key", yes, I would say that it would be possible to obtain the names of the wells and the locations; by referring to the list from which this pressure-trend chart was made, it would be possible to locate any well that was desired.

Q. And that list is contained in your working papers?

A. That is correct.

Q. I hand you your working paper, File No. 11, and ask you whether the pages which I show you are the ones that you just referred to.

A. Yes, said pages carrying the title of "Group Areas West Panhandle Field, Rock Pressures" and the wells for each group placed thereon and the observed pressures listed, commencing with 1931 or before and carrying through the midyear pressure of 1941.

Mr. Culton: Mr. Littman, in order that data shown on Exhibit 136 may be verified in that respect, we will be glad to reproduce that working paper so that it may go in evidence.

Mr. Littman: I appreciate your suggestion and concur [fol. 5111] that it would be very helpful.

Mr. Wheat: How many of those sheets are there?

The Witness: Not very many.

By Mr. Littman:

Q. Now, Mr. Hinton, you assembled data which showed the withdrawals from all of the wells shown on your Exhibit 136-(1)?

A. Yes.

Q. Exhibits 136-(1) to 136-(10)?

A. Yes, sir.

Q. By years?

A. By years.

Q. And you also, had to assume certain withdrawals for each of those wells for each of the years in the future? Did you not?

A. That is correct.

Q. Are those data in your working papers?

A. Not future anticipated withdrawals by wells, no.

Q. Do your working papers show the withdrawals in the future years?

A. No, sir.

Q. By group areas?

A. No, sir.

Q. But you made a determination of them, did you not?
[fol. 5112] A. Yes, it could be assumed by group areas the withdrawal. The deliverability was worked out by group areas.

Q. Now, I would like to have you furnish us with a statement showing the withdrawals by wells for the past, that is, prior to 1941, and the withdrawals for the future years by group areas.

A. That will mean that I will have to make some further calculations because, as I have said, I worked out the deliverability by group areas and, of course, the only way that we could arrive at a future withdrawal figure by group areas for a particular group of wells is to apply the percent of deliverability that could be obtained.

Q. Well, I thought you said a while ago that one of the factors you considered in making this estimate was the amount of gas that was going to be withdrawn from these wells in the future.

A. I did, but when I said, "from these wells", I was giving consideration to all of the wells in these group areas and those that will probably be drilled in the future because unfortunately, we cannot control the withdrawal from the field by our development, and it is necessary to take everyone's development into consideration to arrive at an answer which would be approximately correct.

Q. Well, were you referring to other people's wells?

A. Oh, yes. I have files which show the amount of gas [fol. 5113] that has been produced from every well located in each of the group areas from "A" to "G".

Q. Over what period?

A. Over the past five-year period.

Q. And did you, or did you not, make any assumptions as to the production from each of those wells for each of the future years?

A. Not by individual wells, but in total.

Q. Beg pardon?

A. Not by individual wells, but in total I did, and it is so shown on Exhibit 134.

Q. By "total", do you mean by group area?

A. No, no specific amounts from any individual well, no, sir.

Q. I am not referring to individual wells now. You just indicated that you do that.

A. Yes.

Q. But you said you made some determination of the total withdrawals in the future. Now, what do you mean by "total"? Do you mean total of the wells in the Panhandle Field, or do you mean total of the wells by group areas?

A. I mean the total of all wells in the Panhandle Field as the guiding factor and the withdrawal from all wells in each group area as a further guiding factor.

Q. You mean you considered the total withdrawals [fol. 5114] expected to be made in each of the group areas in the future years?

A. Yes, sir.

Q. Now, do you have those figures?

A. No, I do not, because much of that was mental. I just projected in my thought and knowing that there would be certain changes in the source of withdrawal.

Q. Well then, in view of the fact that your estimate of withdrawals in the future by areas was purely a mental figure, not reduced to writing, we will ask you for the past history by wells.

A. Do you mean all wells or just the company wells?

Q. All wells.

A. Oh.

Q. What is wrong with that?

A. Well, that will be approximately 100 sheets of 14-column paper.

Q. Well, how did you use those data, Mr. Hinton, if it was so voluminous?

A. I made totals of each group of wells and made summary sheets.

Q. Well, do you have the summary sheets?

A. I do.

Q. Are they in your working papers?

A. Yes, sir.

[fol. 5115] Q. Will you please identify those?

A. I will take it back, sir, those files should be in. They are coming in by express and those heavy ones are the ones that were missing here yesterday, and they are coming by express.

I can identify them as soon as they get here. I will be glad to do anything to save copying all those individual records.

Q. All right, we will pass that for the present.

If the curves shown on Exhibit 133 had been different, would that difference have affected the curves which you drew in Exhibits 136-(1) to [(1),] inclusive?

A. You say, would they have been different, also?

Q. Yes.

A. That would be correct, they would be different.

Q. In other words, you used the curves in Exhibit 133 as the major guide? A. Yes, sir.

Q. In your development of the future rock pressure decline in the various areas, group areas?

A. Yes, sir.

Q. Now, what is the next step in your method? Having determined in Exhibits 136-(1) to (10), inclusive, what the expected rock pressure readings would be in the future years on company owned wells and on wells from which gas is purchased, what did you then do?

[fol. 5116] A. I then applied the estimated pressure to our back-pressure data, which has been placed upon curves, and found out, as nearly as possible, what the open flow and deliverability of those wells would be, year by year.

Mr. Culton: You are referring to the individual wells, the back-pressure curves?

The Witness: No, in order to avoid having so many curves, I placed all of the wells located in each of the group areas on one back-pressure curve.

By Mr. Littman:

Q. What do you mean by "back-pressure data"?

A. That is a method used in the testing of gas wells. The data was obtained from such tests.

Do you mean what is a back-pressure open flow test? Did you want me to tell that?

Q. Yes. That might answer the question.

A. A back-pressure open flow test is a method of testing gas wells which has been developed by the United States Bureau of Mines, and is more completely described in Monograph 7 of the United States Bureau of Mines.

The test of a well is obtained by producing the well, usually through a critical flow prover or orifice meter, at such a rate that arrives at a stabilized flow where there is no change in pressure. That is repeated, usually for four rates of flow for each well.

[fol. 5117] After this data has been obtained it is then necessary to go through and work out the data by formulas which have been furnished by the United States Bureau of Mines and the Railroad Commission of Texas, and the observed pressures are converted to absolute pressures and squared.

The rate of flow is obtained by applying known coefficients for certain orifice plate sizes and are corrected for both temperature and specific gravity.

The difference in the square of the absolute pressures at various points of stabilization plotted against the rate of flow on logarithmic paper, log-log, it being the same scale both ways, will produce a straight line through all points if the test is satisfactory.

Q. Do you have your back-pressure curves here?

A. Yes.

Q. Without going into too much detail, I wish you would take one of them and explain the operation of the curves on the chart.

Mr. Culton: In that connection, on the assumption that, having made your curve, it is really a straight line, is it not?

The Witness: It is on logarithmic paper.

Mr. Culton: You can then determine what the well is capable of delivering at any given pressure, if there is no [fol. 5118] change in the physical condition of the well?

The Witness: Yes, that is correct. I did not complete my explanation there.

(Continuing) Because the absolute open flow is obtained by observing a closed-in well head pressure, converting to absolute and squaring that pressure and then adding the weight of the column of gas to that. The intersection of the lines, which is drawn through the four test points with a horizontal line placed on the graph at the point the pressure places it, gives the absolute open flow of the well.

This particular graph which has been placed on the easel is for the company wells located in Group Area "A".

Mr. Culton: Mr. Examiner, I suggest that that should be marked for identification in some way. I don't know whether counsel expect to offer it in the record or not.

Mr. Littman: There are a number of these and I didn't think, Mr. Culton, that it would be necessary to offer any more charts on this subject. My understanding is that the logarithmic chart is a mathematical method of determining the deliverability of the wells and I thought, perhaps, if Mr. Hinton explained, it might be sufficient.

Mr. Culton: All right.

The Witness: The small circles shown on this graph represent a point of stabilized flow for the well. It can be noticed that in most cases there are four shown for each well, however, some of them have three.

[fol. 5119] The Railroad Commission of Texas requires that we take four points. That is in the event that one point does not show complete stabilization at the completion of the calculation of the test, the other three can be used without going to the field to secure additional data.

Mr. Culton: In other words, the point is a certain rate of flow?

The Witness: That is right.

Mr. Culton: And you have to make a test on these four different rates of flow?

The Witness: That is right.

Now, in order to apply the pressure decline to this graph, we merely take the pressure which is shown, that is, that can be expected, by reading down the graph for any year—

By Mr. Littman:

Q. (Interposing) You are referring to Exhibit 136-(1) to (10), inclusive?

A. (1) to (10); and by squaring that pressure after it has had a barometric pressure added to it, which is whatever barometric pressure should be added for that portion of the country.

That is then squared and multiplied times an Es factor which gives consideration for the weight of the column of gas in a producing string of the well.

[fol. 5120] By taking that square of that well and plotting it on the graph, then the absolute formation open flow of that well can be read. If the open flow is desired to only the top of the well, the application of the Es factor is not applied.

Q. But you do not use the open flow in your estimate, do you?

A. No, not to any extent, other than this, that the State law provides that it is not lawful to produce a well at a greater rate than 25 percent of its absolute open flow. Naturally, we cannot lower our working pressures at any time, so that the amount of gas that we take from those wells will exceed 25 percent of the potential of the well.

Mr. Culton: I believe this fact may come in, after you have determined three points in a line, you then draw your line through those three points, do you?

The Witness: That is correct, yes.

Mr. Culton: Now, is it true that by extending that line to higher pressures or lower pressures, you can determine what that well would deliver at those higher or lower pressures, respectively?

The Witness: You can tell what the absolute open flow will be.

Mr. Culton: That is what I meant.

The Witness: In order to find out what that well will deliver, it is necessary to take the difference in the squares [fol. 5121] between the working pressure of the well, atmospheric pressure, and then read that on the graph here.

If the difference in squares should happen to be 10, then we will read at the bottom of the chart the amount of gas that well will deliver.

By Mr. Littman:

Q. What do you mean by "working pressure"?

A. The pressure at which the well is forced to produce gas.

Mr. Culton: There that would be zero.

The Witness: It is really back-pressure, that is what it is.

By Mr. Littman:

Q. Is that at the top of the well or where?

A. This usually occurs at the top of the well, yes, sir. There could be a partial break in the well, whereas the working pressure, actual pressure, which the formation was forced to produce against, would be different than the working pressure on the system into which it is produced.

Q. Have you completed your explanation of the logarithmic chart?

A. If everyone understands it, I have.

Q. Will you please identify each of the symbols appearing on that logarithmic back-pressure chart?

A. The vertical scale on this log paper is shown as [fol. 5122] thousands P_f squared minus P_s squared, that being the difference between the pressures at the formation and the pressure at which the stabilized flow was obtained.

The horizontal scale reads in Q in M. c. f. per day and this is 100, 1000 and 10,000 M. c. f.

[fol. 5125] By Mr. Littman:

Q. Mr. Hinton, will you define the meaning of the term " P_f " as it is used in your logarithmic charts which have been here referred to as back-pressure charts?

A. " P_f " stands for the absolute formation pressure in the reservoir.

Q. Did you derive those pressures from the pressure-trend charts which have been identified as Exhibits 136-(1) to 136-(10)?

A. Those pressures are not reflected upon the back-pressure open flow chart.

Q. Where did you secure your P_1 values in making your estimate?

A. To what estimate do you refer?

Q. Your estimate of gas that will be recovered, as shown in Schedule 5 of your Exhibit 43.

A. Yes, Sir—

Q. (Interposing) "Yes" what?

A. I was going to finish.

The application of the pressures shown on Exhibit [fol. 5126] 136-(1) to (10), inclusive, are applied to the back-pressure open flow curves and the P_1 is obtained by taking the well head pressure at each point of test, mid-year test, and by—

Q. (Interposing) For each year shown in Exhibit 136-(1) to (10)?

A. Yes.

(Continuing) And making the proper allowance for the weight of the moving column of gas in the producing string of pipe and also adding the barometric pressure to the well head pressure to convert it to absolute pressure.

Q. Now, will you please define the P_1 pressures which are shown on your back-pressure charts and which you used?

A. The P_1 pressure is obtained by observing a pressure at a stabilized rate of flow, and then making the proper allowance for the weight of the moving column of gas in the producing string and by adding the barometric pressure to the pressure, that is, well head pressure plus the weight of the moving column of gas to convert it into absolute pressure, and that is the sand face pressure at that rate of flow.

Q. Where did you obtain your P_1 pressures which you used in making your estimate?

A. I obtained them from the pressure-trend charts, Exhibit 136-(1) to (10), inclusive.

Q. I am now speaking of P_1 not P_2 .

A. That is right.

[fol. 5127] Q. How did you obtain the P_1 pressures from Exhibits 136-(1) to (10)?

A. By taking the capacity of the pipe line system into consideration and finding out what the working pressure at the well head would be at the various years, and by so obtaining the working pressure, I then obtained the P_s data.

Q. Now, the P_s pressures bear a relation to the pressures at the first compressor station which, in this case is Sneed?

A. Yes, that is correct.

Q. And those pressures are higher than those which are at Sneed at various years?

A. That is correct. If they were lower, the flow of gas would be from Sneed station back into the well, rather than from the well to Sneed station.

Mr. Littman: Will you please read back that last answer?

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. Are the P_s pressures which you used in making the calculation set forth in your working papers?

A. They are, but they are not in the best form that could be obtained or produced, due to the fact that there was a very, very short time to solve a problem of this size.

It was necessary to go into some approximations. There- [fol. 5128] fore, the data that are reflected in working papers are to the degree of accuracy that can be obtained by the application of an average pressure to an average back-pressure open flows of the wells located in each group area.

I might add that since that time I have been working, as time was available, on trying to detail those by taking each well and assuming that the pressure drop on each well would be the same as the average for all wells in the group and trying to get, maybe, a more complete answer by working the problem in that manner.

Regardless of which manner or which method is used, there is going to naturally be some degree of error. It is impossible to make a forecast into the future that will be absolutely accurate.

Q. Within what percentage range would you say that the figures might be off, one way or another?

A. Assuming that the characteristic of the well does not change, I would say that the percentage of error should not be greater than five percent.

However, again, the accurateness of the estimate is changed, because we know from experience that the characteristics of those wells will change, and the change will be a decrease, and we make our future estimate based on the present characteristic of the wells.

We are certain that that is the best possible amount that [fol. 5129] could be expected.

Trial Examiner: The method that you have been describing has to do with the present characteristic of the well, has it not?

The Witness: Yes, sir.

Trial Examiner: Is that the method used by other men engaged in similar problems in that field?

The Witness: Yes, sir.

Trial Examiner: So that the method you have described and which you have now applied, is the customary method to determine the present conditions of the wells?

The Witness: That is correct.

Trial Examiner: That prevails throughout the industry in that area?

The Witness: In the Panhandle Field, yes, sir.

Mr. Littman:

Q. You stated a while ago that you secured the P₁ pressures from Exhibit 136 (1) to (10), inclusive, is that right?

A. That is the basis for them, yes, sir. They are not taken directly from them.

Q. Will you give us an example, a specific example, of how you developed the P₁ pressures?

Trial Examiner: Before you do that may I ask one more question relating to those I just asked. How long

{fol. 5130} in the past has this method been in common usage?

The Witness: By two of the major companies in the Panhandle, namely, the Texhoma Natural Gas Company and the Canadian River Gas Company, this method has been in common usage since 1931.

As far as our company is concerned, it is only during the past three years that we have adopted this method.

Trial Examiner: Is this the method employed by the Railroad Commission, in so far as they make tests of their oil?

The Witness: No, sir. It is approximately the same. I am not quite sure what method they might be using, but they did use the draw-down method, which is, in oil, similar to the pull-down in the gas industry?

Pull down the pressure from the closed-in pressure for a certain rate of flow and in the oil, they pump so many barrels per day and they find out what the pull-down has been on that well.

I am not too familiar with the testing of oil wells, however.

Your question, Mr. Littman, was to give a specific example of how the P₁ pressure is obtained.

By Mr. Littman:

Q. That is right, and make reference to your working papers as you go along, identifying the exhibit and the working paper from which you derive your figures.

{fol. 5131} A. From the working paper, File No. 11, titled "Group Area Rock Pressure Summary for Texas", we will turn to the sheet for Group "A".

Now, in 1942, we hope to be able to furnish an intake-suction pressure to the Sneed station of 293 pounds. The working pressure average for Group Area "A" [hwith] that pressure will be 317 pounds gage, which, converted to absolute, will be 330.2.

The 330.2 is then squared and the square of 330.2 pounds is then multiplied by the Es factor which provides a proper consideration for the weight of the moving column of gas

in the producing string, and thus the P_s pressure is obtained.

Q. The result which you obtain by the method which you just described gives you P_s squared, rather than the P_s pressure, does it not?

A. Yes, it does. The P_s can be obtained by taking the working pressure at the well head absolute and adding the weight of the moving column of gas to it.

I am sorry that I did not describe that properly at first.

Q. Now, you showed us how you arrived at the P_s pressure from the Sneed station.

A. Yes, the difference in the pressure at the intake side of Sneed station and the working pressure at the well head is governed by volume and capacity of the pipe line system.

Q. But you did not show us how you arrived at the P_s [fol. 5132] pressure from the pressure-trend chart, Exhibits 136 (1) to (10).

A. All right. The pressure-trend charts show what pressure can be expected in each of these group areas. Then, by experience, we know, by observing the pressure drop in the pipe line system, what pressure drop there will be between the intake side of Sneed and the well head.

Therefore, the intake pressure of Sneed is governed entirely by the pressure-trend of the well.

Q. Isn't it a fact that you set the pressure at Sneed station by basing it upon the pressures at the wells?

A. That is right, the pressures at the wells govern the intake pressure at Sneed.

Q. And you have agreed to supply us with the working pressures that you used? A. Yes, sir.

[fol. 5133] By Mr. Littman:

Q. Now, Mr. Hinton, it appears that we are near the end of the step-by-step description of your method.

A. May I make an addition to the answer to your last question; when we agreed that the pressure at Sneed is governed by the well head pressures, I would like to say that it is going to be necessary to install some individual compressor units to hold the Sneed suction pressures that have been set out here.

That is, all wells are not going to be able to produce gas with a working pressure at the Sneed station set out here.

I just wanted to make that clear here, that it will be necessary to install some individual well compressors.

Trial Examiner: Is that partly due to the lack of uniform pressures as between different wells feeding into the laterals?

The Witness: Yes, that is right; and there are some wells that are entirely different from the wells surrounding it and I give, for example, our well located on the Sneed Ranch in Section 28.

That well has never been able to produce a quantity of gas that compares with the quantity at this time that can be produced by the wells surrounding it.

By Mr. Littman:

Q.— Now, Mr. Hinton, if I correctly understand your testimony [fol. 5434] with respect to the last step which you described, you used the curves shown in Exhibit 136 (1) to (10), inclusive, for the purpose of determining the rock pressure of the wells of Panhandle Eastern and its vendors in each of the areas in the future years, is that right?

A. That is correct.

Q. And using that information and those data, you then applied these various pressures that you described and applied the logarithmic charts, called the back pressure charts and from those charts worked out the amount of gas that will be expected to be derived from the wells in each of the areas, Groups "A" to "G". Is that correct?

A. Yes, that is substantially correct, other than it has been assumed, in all cases, that wells owned by other than Panhandle Eastern, the gas purchase contract wells, will supply horsepower as required to enable them to put gas into our system or they will be forced to install some individual well compressors, the same as we will, and I assumed all the way through that both Panhandle Eastern and the other [owners] of the wells connected to our system will install additional horsepower whenever necessary.

Q. Will you state how you then secured the figures of production in the West Panhandle Field which appear in Schedule 5 of your Exhibit 43, and in Exhibit 131?

A. That being the total amount of gas which is expected [fol. 5135] to be produced from the Panhandle Field, both under the basic load or present volumes and future anticipated volumes.

Q. We were referring to the future load.

A. The future load, yes, that is substantially correct, other than you will note that they are all round numbers, which indicate I do not mean that that is exactly the amount that we will be able to take, but I feel that it will be very close to it.

Q. I wanted you to complete the last step of your method by which you secured the figures shown in Exhibit 131 and in Schedule 5 of your Exhibit 43.

A. In order to determine what amount of gas a well will deliver, it is necessary that the working pressure at the well head be obtained and made into an absolute pressure and squared, multiplied times an Es factor or the weight of the moving column of gas added to that pressure to get the sand face pressure at the rate of flow at which that well will work.

• It is then necessary to take the closed-in pressure by gaging the well and converting that into an absolute pressure and squaring it, then multiplying it also by the Es factor, which obtains the closed-in formation sand face pressure.

The difference in the squares of those two numbers is then placed upon the back-pressure open flow chart and the result is read from the horizontal scale, which will reasonably closely tell the amount of gas that can be expected to be produced at that working pressure from that well.

Q. And you did that for each well?

A. No, I told you a while ago I did not have time to do it for each well, and it is not in my working papers. I used an average all the way through, but I have been working it out by wells since. I do not have it complete.

Q. You secured the production figures for each area?

A. Yes.

Q. By the method that you have described and separately as between Panhandle Eastern's own wells in each area and as to the purchase wells in each area, is that right?

A. Yes, I believe that is right, except that the amount of gas that is going to be taken from purchase wells and company wells is not governed by deliverability alone, because we prorate our gas on a formula which allocates 50 percent of the total amount on the basis of acreage alone.

Therefore, the acreage, unless that formula is changed, will always remain constant and, in the division of that gas, it was assumed that the open flows of the purchase wells and the company wells would decline at a parallel rate, and the division of the gas was obtained by allocating half of that production on the basis of acreage and half on the basis of open flow.

Therefore, the result was not obtained by deliverability [fol. 5137] alone.

Q. And then you added the total production thus indicated to each area to secure the total amount of gas which you estimate will be produced in the West Panhandle Field in each of the future years from 1942 through 1960 shown in Exhibit 131?

A. I do not believe that is reflected in my working papers, but that is true, that is what was done.

Q. What I was endeavoring to establish was simply this, Mr. Hinton, that you made the estimate for each of the areas for each year, and then totaled the estimate production for each year and included them in the columns as shown in Exhibit 131 for the West Panhandle Field, isn't that right?

A. They were made on that basis, but they do not exactly check, due to the fact that, as I have explained, proration enters into the problem as well as deliverability.

There is also another thing that I might call your attention to there, and that is that the quantities of gas that could be taken each year could deviate from those set out, and they could, in some cases, be doubled if we had the system capacity to take the gas out.

For instance, right now, we could produce from our present development probably almost twice as much gas from the Panhandle Field as we are now, but, in order to do that, the capital expenditure required will be greater than good [fol. 5138] business practice would justify.

Trial Examiner: What would be the nature of that additional expenditure?

The Witness: That would mean at least one more 26-inch line. Well, roughly, it would mean an additional 6,000 horsepower.

Trial Examiner: What is your average unit?

The Witness: The Cost of an average—

Trial Examiner (Interposing) No, the horsepower. How many units would that mean, 6,000-horsepower?

The Witness: That would mean about five. Those are 1,300 horsepower units in the Sneed station.

Trial Examiner: That is to serve the present holdings?

The Witness: That is right. We are adding two more this year unless we cannot get them.

Mr. Culton: What would be the length of that 26-inch pipe line, how many miles?

The Witness: That would be about 109 miles, and if we would increase our rate of withdrawal from that field, it would mean that the number of years we could operate in the field would be shortened by the increased withdrawal.

By Mr. Littman:

Q. Now, Mr. Hinton, am I correct in understanding that your estimate of the production by Panhandle Eastern in the West Panhandle Field for the future years as reflected [fol. 5139] in Exhibit 131 and in Schedule 5 of Exhibit 43 is based primarily upon the data shown in Exhibit 134 and which is graphically shown by curves in Exhibit 133?

A. Primarily, that is correct.

Q. Am I correct in also stating that you have based your estimate, in large part, upon the belief that production in the Panhandle Field will proceed in the future at a decelerating rate per pound of rock pressure decline?

A. I agree with that, and say that you are correct, other than when we speak of a decelerating amount of gas for the same pressure drop, I would like to say that that does not apply to a true pressure, but applies to the pressures which are obtained from observing well head pressures.

Mr. Culton: You mean, it does not apply for equilibrium pressure?

The Witness: That is what I was going to say. It does not mean that these pressures we are speaking of are true equilibrium pressures.

Therefore, there will not be a greater amount of pressure drop for the same amount of production based on true and accurate pressures, but the pressure which we will observe at the well head will indicate that that is what is happening.

By Mr. Littman:

Q. And the rate of pressure drop which you applied, substantially, is that which is reflected in the chart which [fol. 5140] has been identified as Exhibit 135?

A. Yes, sir. I do not see how we could use or disregard the use of anything that establishes a constant in this field that is proven by actual field performance.

Q. So that your answer to my question is, "yes"?

A. In short form, that is it, yes.

Q. Now, if the rate of pressure drop shown in Exhibit 135 is incorrect and if the curves which appear in Exhibit 133 are incorrect and in error, then, to that extent, your total estimate would be in error. Is that correct?

A. No chain is stronger than the weakest link.

Q. And that is another way of saying that you would have to revise your entire estimate of gas produced as shown in Exhibit 131 and in Schedule 5 of Exhibit 43 if the conclusions which are reflected in Exhibits 135, 133 and 134 are found to be substantially in error?

A. Yes, and I would be most happy if they are found to be in error and that can be lengthened.

Q. And that can be what?

A. And the life of the field can be lengthened.

Q. And does the same answer go with respect to your estimate of capital additions?

A. No, that does not go for capital additions.

[fol. 5141] Mr. Littman: Well, I will confine my question purely to the five years, and I mean nothing more than the five-year estimate of capital additions which you have submitted in Exhibit 42.

The Witness: There would have to be an extremely high percentage or error to change the required capital expenditure in any great amount.

Q. Now, let's go back to Exhibit No. 134, Mr. Hinton. Do you have copies before you of it?

A. I have it now.

Q. According to your Exhibit No. 134, what remaining life is indicated for the Panhandle Field?

A. The remaining life of the Panhandle Field is not indicated.

Q. What conclusions with respect to the remaining life of the Panhandle Field would you draw from Exhibit 134?

A. I would draw the conclusion that, as indicated, there will be a drop-off in the total amount of gas that [fol. 5142] will be withdrawn from the field, and many of the major pipe lines will probably cease to take gas from that field when the pressure gets low enough that it is no longer economical to install the required horsepower to take loads out in sufficient volumes to meet their market requirements, but after that period, gas will be produced from the Panhandle Field for a period of many years for local markets and local consumption.

Q. I take it that you include Panhandle Eastern in the category of the pipe line companies which will have to cease operations, along about the period which you have described?

A. I do.

Q. That is, earlier than for those who serve the local markets? A. Yes, sir.

Q. Well, to be more specific, let's look at Condition "C" which is reflected in the last three columns on the right-hand side of Exhibit No. 134.

I note that in 1955, according to this exhibit, 18,165,000, 000 M.c.f. will have been withdrawn under the Condition which you have described as Condition "C". Is that correct? A. That is correct.

Q. And the remaining rock pressure in the Panhandle Field will be 70.17 pounds, is that correct?

A. The same type of rock pressure as we have been [fol. 5143] referring to, throughout.

Q. And, in 1956, the total estimated cumulative withdrawal for the Panhandle Field is 18,786,000,000 odd M.c. f., and the remaining rock pressure, according to this exhibit, is 50.15 pounds. Is that right?

A. That is correct.

Q. Now, would you expect any of the major pipe line companies to operate in the Panhandle Field under Condition "C" after 1957?

A. If there is some manufacturer who can produce a type of compressor that can be operated for substantially less money than is required to operate the common type of compressor now used, it is possible that they might go slightly below that pressure, but it is not probable.

Q. In other words, in all probabilities, according to your testimony, the major pipe line companies, including the Panhandle Eastern Company, operating in the Panhandle Field, will have to pull up stakes and go out of the business of producing gas in the Panhandle Field at the end of 1956?

A. That would be my idea of being very close to the time that that will occur.

Q. You do not think that Panhandle Eastern is going to stay in the field any longer than any of the other natural gas pipe line companies?

A. No, I think Panhandle Eastern will probably leave [fol. 5144] the field before even some of the other major pipe line companies, due to the fact that this company has had foresight to create for themselves a reserve in fields where the withdrawal has been very slight to date and, for that reason, they can move their production from the Panhandle Field and go to the Hugoton Field located in Kansas, Texas and Oklahoma, and develop acreage and produce gas for less money than would be required to produce gas in the Panhandle Field at the pressures which will be encountered in the year 1956.

Q. Now, you would expect the life of Panhandle Eastern's reserves to be as long as those of the reserves of the field, would you not?

Mr. Cutton: You mean the average reserves, or the average of everybody in the field?

Mr. Littman: Do you understand my question?

The Witness: I do not believe I understand. I was a little confused in thought. Do you mean the average reserve of the entire field, or the average reserve of the companies operating in the vicinity in which we operate?

By Mr. Littman:

Q. You do not expect Panhandle Eastern to exhaust its reserves in the Panhandle Field ahead of any of the other pipe line companies, do you?

A. No, I do not.

Q. Now, will you name the figure which you consider to [fol. 5145] be the recoverable gas reserve in the Panhandle Field?

A. To name that figure, it would be necessary to take each individual well because I think that the pressure at which it will be no longer be profitable to produce gas from the well is governed by individual wells, and any figure that would be named would not apply to the field.

In other words, there are going to be some wells that will be abandoned at extremely high pressures. I look for that to occur in Area "D", and I also expect some wells to produce at a profitable rate down to very low pressures, even some below 50 pounds.

Q. Well, looking at Column 12 in Exhibit 134, what would you say would be the maximum amount of gas that would be recovered from the Panhandle Field from the beginning down to the end?

A. Somewhere between 20 and 21 trillion feet of gas but that is without time limit.

Q. Now, the 20 billion M.c.f. figure appears in Column 12 in the year 1958, and indicates a remaining rock pressure of 8.83 pounds.

A. And again, we are considering the same type of pressures that have been considered all the way through.

Mr. Culton: That is, average pressure?

The Witness: That is average pressures, without consideration to the vertical thickness of pay.

[fol. 5146] Here is what happens when the pressure gets that low, Mr. Littman, and that is, the rate of travel of that gas through the formation is very slow, just applying the ratio of the difference of squares, but it is also

slowed again by the fact that it has deposited a great deal of moisture within that formation.

Now, we know that is going to happen, and the permeability channels have been cut down and, therefore, there will be areas of a great deal higher pressure than the 8.83 which will be observed at the well head, but the time element must be taken into consideration for that gas to flow into the well bore.

By Mr. Littman:

Q. Do you say that the average abandonment pressure in the Panhandle Field will be in the vicinity of 8 pounds? A. No.

Q. It would have to be, for you to get out more than 20 billion M.c.f., would it not?

A. You are not keeping in mind we are speaking of pressures at the well bore and not the pressure which would be encountered between well bores if a new well would be drilled when the actual observed pressure of 8 pounds is observed.

Mr. Culton: In other words, there will be a gradient all over the field, is that correct?

The Witness: That is correct.

[fol. 5147] By Mr. Littman:

Q. But the column is headed, "Estimated pressure decline, pounds, Condition No. 3, well head gage."

A. Yes.

Q. I thought that meant at the well head.

A. It is correctly titled, and the pressures of which I am speaking are well head pressures.

Q. Then you put the total recoverable reserves of the Panhandle Field from the beginning to the end at approximately 20 billion M.c.f.?

A. I would say that it will probably run between 20 and 21 billion M.c.f., and it will never exactly be known because we do not know how much gas was produced prior to 1935 from the sweet gas formation.

Mr. Culton: In other words, nobody ever will know what the answer ought to be?

The Witness: No, sir.

Mr. Culton: After it is all over?

The Witness: No, sir.

By Mr. Littman:

Q. However, the best estimates of the amount of gas withdrawn from the beginning of production in the Panhandle Field through the year 1940 is the figure which you show in Exhibit No. 134, Column 12, of 8,325,985,000 M. c.f. Is that right?

[fol. 5148] A. That is right, except you said, "985,000 M.c.f.," and that should be "985,000 M.c.f." I mean, that would be three too many zeroes on to that figure.

Q. Well, is it a figure of 8 billion M.c.f.; isn't it?

A. Yes.

Q. I was right, in the first place, wasn't it?

A. No, you said 985,000 M.c.f.

Q. I still think I am right. Your figure—

A. (Interposing): I just want to be sure.

Mr. Culton: There is no question about what the correct interpretation of it is.

The Witness: I was just trying to keep the three zeroes out of the record; that is what I was trying to do.

Mr. Wheat: May we have the precise amount of the figure in the record. Let's state it another way to be sure the record is correct.

The figure is 8,325,985,000,000 cubic feet, is that correct?

The Witness: That is correct.

Mr. Littman, you were correct in the first, because I neglected to note that there were two "M's" heading that column.

Mr. Littman: I thought that was the trouble.

By Mr. Littman:

Q. Now, what would be, according to Exhibit No. 134, the remaining probable gas reserves as of December 31, [fol. 5149] 1940, according to your Condition "C"?

A. If the total recoverable reserve from the Panhandle Field should be 20 trillion cubic feet, the remaining re-

serve would be 11 trillion 674 billion 15 million cubic feet, and if the recoverable reserve from the Panhandle Field should be 21 trillion cubic feet, the remaining reserve would be 12 trillion 674 billion 15 million cubic feet.

Q. So that, according to your Exhibit No. 134, the recoverable gas reserves remaining in the Panhandle Field, as of the end of the year 1940, is between 11 and 12 trillion cubic feet?

A. That would be my idea, yes, sir.

Q. Have you heard of an engineer by the name of Ralph E. Davis? A. Yes.

Q. Do you consider him an eminent authority on the subject of estimated gas reserves?

A. I think Mr. Davis enjoys a very nice reputation as a geologist and engineer.

Q. Did you hear him testify in these proceedings?

A. No, sir, I did not.

Q. Now, Mr. Davis, in Exhibit No. 76; Page 1, in this proceeding, makes the following statement in a letter dated November 12, 1940, addressed to the Board of Directors of the Panhandle Eastern Pipe Line Company:

[fol. 5150] "Our most recent study of the Amarillo Field indicates that the proven gas acreage covers an area of approximately 1,478,000 acres and that the recoverable gas reserves, as of September 30, 1940, are not less than 17 trillion cubic feet."

Bearing in mind that the 17 trillion cubic feet estimate of Mr. Davis was made within three months of the December 31, 1940, figure which you have just given, I will ask you whether it is your testimony that Mr. Davis is right or wrong in making that statement?

[fol. 5154] A. I think that Mr. Davis probably used the best knowledge he had of the field, but I do not think he knows as much about the Panhandle Field as I do.

Q. How much higher is Mr. Davis than you in the estimate?

A. I do not know what his estimate is. I have seen it in reports on the acreage owned by Panhandle Eastern.

[fol. 5153] Q. Assuming that Mr. Davis' estimate of remaining recoverable reserves of 17 trillion cubic feet, as of September 30, 1940, is correct, what would be the remaining recoverable gas reserves in the Panhandle Field as of December 31, 1956, if there were withdrawn the amount of gas estimated by you under Condition "C", Column 12 in Exhibit 134?

A. There would be a remaining reserve, if it is assumed that Mr. Davis's 17 trillion cubic feet of remaining reserve as of September 30, 1940, is correct, of 6 trillion, 539 billion cubic feet.

Q. Remaining as of December 31, 1956? Is that right?

A. That is correct.

Q. And what would be the remaining reserves according to your estimate?

A. There would be a remaining reserve of 2 trillion, 213 billion, 15 million cubic feet.

Q. Now, is the last figure based on—

A. (Interposing) That is based on a total of 21 trillion cubic feet. If that would be based on 20 trillion cubic feet, it would be 1 trillion, 213 billion, 15 million cubic feet.

Q. And it has been your testimony that the total recoverable figure would be between 20 trillion and 21 trillion cubic feet, is that correct?

[fol. 5154] A. That is correct.

Q. Now Mr. Hinton, I would like to have you refer to the table on Page 10 of your Exhibit 42.

Mr. Culton: Before you get off of that Davis matter, Mr. Davis estimated how much in the Panhandle Field reserves belonged to Panhandle Eastern?

The Witness: Not less than 750 billion cubic feet.

Mr. Culton: And how much do you anticipate from your study that Panhandle Eastern will be able to produce from its reserves by the time you think that they will probably have to abandon Panhandle Field? Do you recall what that is?

The Witness: No, but I think it is in excess of the amount that Mr. Davis has set out.

Mr. Culton: If it is below that, it is not very substantially below it, is it?

The Witness: No, it is that much.

Mr. Littman: I think it is below.

Mr. Culton: You think it is slightly below? Let's get the figure.

The Witness: Yes, it is below that.

[fol. 5155] Mr. Culton: What is your total?

The Witness: My total is 718 billion cubic feet.

By Mr. Littman:

Q. How do you secure that total, Mr. Hinton? Would you mind telling us the breakdown of the figure?

A. By just merely adding the amounts that we expect to produce from the field through the years 1941 to 1960.

Q. And what is the figure that you just gave?

A. 718 billion cubic feet.

Mr. Culton: And what is the production for the preceding calendar year, say, from August to August in Texas?

The Witness: From our reserves?

Mr. Culton: Yes, approximately.

The Witness: You say, from August?

Mr. Culton: Starting with September the 1st, and ending with July 1st, September 1940 to July 1, 1941.

The Witness: You couldn't make that October, could you?

Mr. Culton: That would be close enough.

The Witness: I have the October report here, handy.

Mr. Culton: All right.

The Witness: That was 40,013,670,000 M. c. f.

Mr. Culton: And that added to 718 billion, as of a year ago? In other words, Panhandle Eastern has been

producing approximately 40 billion a year for the last year or so from the Panhandle Field?

[fol. 5156] The Witness: Just for the last year, yes.

By Mr. Littman:

Q. Just a minute, Mr. Hinton. You have been going through the year 1960 for Panhandle Eastern figures, haven't you?

A. Yes, because I had them added. There would be a deduction of 14 billion from that, making a total of 704 billion cubic feet that we would expect to produce through the year 1956.

Mr. Culton: Then, to get it back to last year, you would add another 40 on, approximately? You would start from October of last year?

The Witness: Yes, that is right, because this letter was written in 1940. I thought it was 1941. I didn't notice the date there very closely.

That is correct. That would be a total of 744 billion cubic feet.

By Mr. Littman:

Q. From when to when?

A: From November 1940 to December 31, 1956.

Trial Examiner: Before you reply to Mr. Littman's question concerning the table on Page 10 of Exhibit 42, please supply a bit of additional information concerning your factors which have resulted in the conclusions you have stated in the testimony today and yesterday.

[fol. 5157] I believe on the letter of Mr. Davis, to which you have just referred and which is shown in the document marked for identification as "Exhibit 107"; the present Panhandle acreage, including leases, comprises 4.43 per cent of the total proven area of the Amarillo Field.

I have just read that phrase from that letter of Mr. Davis.

The Witness: Yes, I check it here on this letter.

Trial Examiner: May I ask whether, in your studies, you have confined your estimates entirely to the produc-

tion of the acreage which is now owned or under lease from the company?

I should say, now producing for the company, either under gas purchase contracts or under royalties.

The Witness: Yes, just on the acreage now held by either development, delay rental or gas purchase contracts.

Trial Examiner: And you have measured the predictions of consumption by your company in the expanding market by the present estimated rate of increase, have you not?

Your predictions of future years are based on your expectations?

The Witness: Yes.

Trial Examiner: And those expectations are based on your experience since the company began to operate?

The Witness: That is correct, yes, sir, and Mr. Morton's forecasts.

Trial Examiner: And in making that estimate you have [fol. 5158] had, of course, close access to all of the company's records showing its growth?

The Witness: Yes.

Trial Examiner: Have you had similar access to the records showing the growth of the other companies taking from this same area?

The Witness: Yes, I have.

Trial Examiner: And have you made similar calculations with reference to their future expectations?

The Witness: Yes, I have.

Trial Examiner: Have you taken into account the factors which will result in an ultimate saturated market in the territories they now serve?

The Witness: All with the exception of Cities Service, which seems to stay along at about the same rate of withdrawal year after year for the markets which they serve from the Panhandle Field.

The increase in withdrawal from that field will be principally by Panhandle Eastern Company, the Texhoma Natural Gas Company, which produces for the Natural Gas Pipe Line Company of America, and the Northern Natural Gas Company serving Nebraska and Minnesota.

Trial Examiner: Are the markets which are served by the companies serving the other 95 percent, or taking the other 95 percent, in your judgment, as stable as the market [fol. 5159] which your company serves?

The Witness: Yes, probably more stable, because we serve an industrial area and much of the gas which is taken into Kansas City, through the Cities Service line, is house heating and firm load gas.

The gas which is taken by the Northern Natural will not serve as large a percent or as high a number of industrial customers as the Panhandle Eastern will probably serve in the area which they serve.

Mr. Culton: You haven't mentioned Canadian River. What recognition do you give to Canadian River and the Denver Line?

The Witness: The Denver Line contemplates a pick up in their load, but not in the proportions that the companies already mentioned contemplate.

However, the Canadian River acreage furnishes one-fourth of the load for the Natural Gas Pipe Line Company of America and, therefore, that acreage will participate in the market increase for the Natural Gas Pipe Line Company of America.

Trial Examiner: In making these compilations, has it been necessary for you to consider the future of the carbon black industry?

The Witness: Yes.

Trial Examiner: And the casing head gasoline process?

The Witness: That is right. By studying the monthly [fol. 5160] report. We get a monthly gasoline plant report from the Railroad Commission.

Trial Examiner: And your present estimates of the future are based on the continuance of present practice?

The Witness: That is correct. I do not look for any large expansion in the carbon black industry in the Panhandle Field.

By Mr. Littman:

Q. And your Condition "C", as reflected in Columns 11, 12 and 13 in Exhibit 134, reflects the increased take by all parties, including Panhandle Eastern, from the Panhandle Field in the future years, does it not?

A. That is correct, yes.

Q. Now, if you had adopted and used Mr. Davis' 17 trillion recoverable reserves as of September 30, 1940, you would show a field with a longer life, would you not?

A. Yes, if I would adopt them.

Q. And you would have to revise your own estimate of the recovery to be secured by Panhandle Eastern in the light of that longer life and in the light of those total over-all reserves, is that correct?

A. That is right. Or, if we would assume there was a remaining reserve of 50 trillion instead of Mr. Davis' 17 trillion, why, the life of our company could be extended a great many more years.

[fol. 5161] Q. So that you and Mr. Davis cannot both be right; is that right? A. That is right.

Mr. Lee: What is right, you are right, or he is right?

The Witness: No, that both of us cannot be right.)

By Mr. Littman:

Q. Now, in other words, you fully expect that Panhandle Eastern will be operating in this field as long as the other pipe line companies operate?

A. That is right, and I hope Mr. Davis is right and I am absolutely wrong, but I don't think he is, because every time that he makes an additional reserve estimate for our company he obtains more information.

If you will trace those down, I think you will find that they are at a declining rate, that the original amount that he set up for this field was greater than the amount which he estimated in his last reserve figure.

That is because he is finding out more about the field. He has been sending a man out on these reports who has been obtaining a great deal of the detail that makes up the

information necessary to make an accurate reserve estimate of this field.

Q. Well, you know, do you not, Mr. Hinton, that Panhandle Eastern has used Mr. Davis' estimate as recently as in 1941 for the purpose of proceedings before the Securities and Exchange Commission for the purpose of floating security issues, do you not?

A. I don't know what they were floating, but I do know that he has made this reserve estimate for our company because I am called on to check the number of acres in most cases when that reserve report is made, to see that he has taken into consideration the correct number of acres.

Q. Were you called upon [the] check Mr. Davis' estimate which was used before the Securities and Exchange Commission, which is the same one which I just read to you a minute ago?

Mr. Culton: Just a minute. I think counsel is wrong on that. I don't think he has offered it. You said that you just read it to him. You didn't offer him this year's report.

The Witness: That was 1940, the one that you handed me.

Mr. Culton: We tender to you Mr. Davis' last one, if you wish to put it in evidence and inquire about it. I think a copy of it has already been handed to counsel early this week.

Mr. Chamberlain: Isn't that Exhibit 107?

Mr. Littman: No, this is not an exhibit in this case.

Mr. Culton: Part of it was offered as an exhibit the other day by counsel.

Trial Examiner: A reference was made to it.

Mr. Littman: Not by me. I think it was by other counsel.

At any rate, I have not read it, but I shall read it at the [fol. 5163] first opportunity.

Trial Examiner: Just one further question, if I may ask it. What consideration did you give to waste and conservation in connection with your predictions?

The Witness: That is a pretty hard figure to make an accurate estimate of. In order to try to obtain a better knowledge of the amount of gas that is being wasted, we have adopted the policy of keeping a well-blowing record and we know how long each well is open to the atmosphere each year and we know how much gas has been tested, and we have talked to the other companies, I have, their operators in the field.

I know about what their policies are about blowing wells and we have included a figure in this amount given for gas wasted to the air.

Trial Examiner: That is a large factor, is it not, in your predictions?

The Witness: No, it is quite small. That runs only from 12 billion to 15 billion a year.

Trial Examiner: When you say that that is quite small, you mean you estimate the loss of gas from field operations and waste to equal 18 billion or 20 billion cubic feet a year?

The Witness: Twelve billion to 15 billion cubic feet a year. That includes gas that is blown to the air during the time that the wells are being drilled into the producing formation.

[fol. 5164] Trial Examiner: You have no very satisfactory data, have you, as a basis for such an estimate?

The Witness: No, sir.

Trial Examiner: So that that is purely a judgment estimate?

The Witness: Yes. The application of judgment to what data we can gather.

By Mr. Littman:

Q. A moment ago I asked [to P] to turn to the table on Page 10 of Exhibit 42. Am I correct in understanding that the rate of rock pressure decline utilized by you in making your estimate was derived from the figures in this table?

A. Yes.

Q. And I believe yesterday you explained how the five points were plotted on the chart, Exhibit No. 135, from the five lines of data shown in this table?

A. Yes, I think we went through that quite thoroughly.

Q. Did you make any personal investigation with respect to any of the figures shown in this table?

A. What do you mean by "a personal investigation"?

Q. Well, did you work these figures up yourself, or did you secure them from certain sources?

A. Why, naturally, I secured them from certain sources and they were worked previous to the time that I worked them, and I checked them.

Q. Now, will you give us the source of the figures [fol. 5165] shown in this table, column by column?

A. The periods shown cover production figures which were compiled by various producers in the Panhandle Field and were taken from the records of the Railroad Commission and converted from 14.65 to 16.4.

Q. What part of these figures, shown in the column headed "Production, M. c. f.", was taken from the reports of the Texas Commission and what part of them from other sources that you generally described?

A. I was looking for that set of figures yesterday, and I thought they would be on Mr. Smith's working papers, but they were not. I haven't located them yet, but they include an amount of gas blown to air by drilling-in, well maintenance, and the set of figures were typed and in the office of the Texhoma Natural Gas Company, I believe.

It might have been in the offices of the Columbia Fuel. They were secured by our representative, who lives in Amarillo, for me.

Q. Well, can you give us the breakdown of these figures in Column "Production, M. c. f."?

A. You mean as to what portion of that gas was used for light and fuel and what portion for carbon black and what portion went to gasoline plants?

Q. No, I mean what portion of these figures were taken from the Railroad Commission of Texas reports.

[fol. 5166] A. The metered gas?

Q. Well, can you give us the amount?

A. To give you the amount, why, we would have to divide it up into light and fuel, casing head, gasoline plant use, and then the estimate of gas blown to air in lease use.

Q. Well, perhaps we can get at it in that way, then. If you can supply the breakdown, perhaps it would clear up my question.

A. Do you question the accuracy of those figures?

Q. I am merely asking about the source, Mr. Hinton. You see, these figures do not coincide in total with the figures shown in the Texas Commission reports.

A. And they will not.

Q. And I wanted to know why and I wanted you to explain for purposes of the record how you arrived at it.

A. They are on a different pressure base, which accounts for one of the reasons that they will not check with the Railroad Commission records.

The second is that the operators in the Panhandle Field have compiled a set of data showing the amount of gas estimated to be blown to the air.

Mr. Peterson, of the Texhoma Natural Gas Company, has furnished that figure that is included in those figures there on Page 10 of Exhibit 42.

[fol. 5167] Q. Suppose you read the breakdown into the record.

A. I am still looking. I don't seem to be able to locate them, however, it will be a pleasure to furnish the breakdown to you at a later date, if you think it would save time, rather than my looking right now.

That was one of the early things that was done in the working of this problem.

Q. Do you suspect that you have the breakdown of these figures in your working papers before you?

A. I suspect that I do.

Q. Well, let's pass that for the moment and see if you can find them a little later. While you are looking for those papers, can you state whether they include casing head gas?

A. They do include casing head gas.

Q. For the entire period?

A. Yes. Of course, you understand that they probably don't include all of the gas from the sweet field because, as I have said before, in the early days the amounts of gas that were produced could only be estimated and the amount shown in total may be in error.

Mr. Culton: That is the August 1, 1935, item, from the beginning, August 1, 1935?

The Witness: Yes.

By Mr. Littman:

Q. Do these figures include all of the dry gas and all [fol. 5168] of the casing head-gas reported by the Railroad Commission?

A. Yes, and an estimate for all gas other than lease use previous to August 1, 1935.

A copy of Mr. Peterson's figures is on an 8½ by 11 photostat and the breakdown is shown on that. I copied it from that to my records after talking to Mr. Peterson and Mr. Cotner, and I feel that the amounts of gas shown there are as nearly correct as it is possible to get them.

Q. Did you also talk to Mr. Massa, who was formerly employed by the Railroad Commission, about that figure?

A. Yes, I did. Mr. Massa has helped me considerably in obtaining data from the records of the Railroad Commission concerning withdrawals.

Q. Well, a good part of these figures is estimated, is that right? A. No, not a good part.

Q. Well, how much of it is estimate rather than metered?

A. Oh, I would say that there is probably somewhere around from 15 to 25 percent estimated in that amount.

Mr. Culton: Is that just in the first amount?

The Witness: Yes, that is just in the amount up to August 1, 1935.

By Mr. Littman:

Q. Is it your testimony that only 15 percent, approximately 15 percent of the 5,197,000,000 figure shown in the [fol. 5169] first line, is estimated?

A. I said from 15 to 25 percent. I am basing that from memory, because I computed a great many figures during the time that the Committee for Conservation of Natural Gas was [function] in the Panhandle Field.

That was in 1933 and 1934. I am just trying to remember just what amount it was, but I believe somewhere between 15 and 25 percent would be correct.

It is not true that the gas was not metered before the Railroad Commission started keeping records. It was measured, naturally, because royalty had to be paid upon that gas. It was only the gas that was used for gasoline plant use that was not accurately metered.

The production to pipe lines and a great deal of the gasoline plant production was metered, but they sprang up so fast and without jurisdiction that, naturally, there were errors in the amounts estimated.

At the present time there is somewhere around one to two percent of the total withdrawal that is estimated.

Q. Well, can you tell us approximately what percentage of these production figures was obtained from sources other than the Texas Railroad Commission reports?

A. I believe that it would be safe to say that, at least, 95 percent of all figures that are shown in Column 2, Page 10, Exhibit 42, will check with the records of the Railroad [fol. 5170] Commission if they are converted to the same pressure base.

Mr. Culton: That is following August 1, 1935?

The Witness: Yes, that is right.

By Mr. Littman:

Q. Now, you refer in your first column to beginning at August 1, 1935: What is the date of beginning?

A. The first gas produced in commercial quantities was somewhat prior to 1926. That was in small amounts.

Q. So that you have approximately a ten-year period in your first line? A. Yes.

Q. Now, in the second line you have a period of 11 months, do you not? A. That is right.

Q. In the third line you have a period of 12 months?

A. That is right.

Q. In the fourth line, a period of 13 months? A. 13.

Q. And in the last line, a period of 24 months?

A. That is correct.

Q. Now, why do you split these data into such different and varying time periods?

A. By trying to arrive at a time that more nearly represents the middle of the period during which the pressures were observed.

[fol. 5171] The reason that the production through 1939 is included in that shown from 8-1-38 to 8-1-40, is due to the fact that the Railroad Commission in that year had included a number of acres which turned out to be in error.

They had weighted their pressure with that acreage and it gave a very decidedly erroneous picture, and for that reason it could not be used in here, because it would give us a result which would be in error, naturally.

Q. How did you eliminate that error?

A. By taking out that acreage the next year. The Railroad Commission found out what they had done. It was merely done by placing the isobar line on the pressure map prepared by the Railroad Commission.

After the adjustment was made, the pressures came back to their natural trend.

Mr. Culton: The Commission itself recognized that error in its next pressure map?

The Witness: That is right.

By Mr. Littman:

Q. Well, what pressure loss in pounds did the Texas Railroad Commission find for the period August 1938 to August 1939? A. May I see your 1939 report?

Trial Examiner: It is right here, if you would like to use this.

[fol. 5172] The Witness: Thank you.

Now, you want to know what the pressure was for the year 1939?

Mr. Littman: Yes.

The Witness: I am reading from the 1939 report published by the Railroad Commission, Page 2, under the paragraph headed, "Total Field."

The weighted average pressure of the entire field in July 1939 was 323.72 pounds per square inch as compared with an average pressure of 337.66 pounds in July 1938.

By Mr. Littman:

Q. Now, what pressure loss is indicated?

A. 13.94 pounds.

Q. Now, you didn't use that figure? A. No, sir.

Q. All right. If you had shown the year, 1938 to 1939, separately, in one of the lines on Page 10 in Exhibit 42, you would have had in Column 3, "Pressure Loss Pounds" the figure of 13.94, would you not? A. Yes.

Q. And what comparable figure would you have had for the year 1939 to 1940?

A. I am reading from Page No. 5 of the 1940 Report published by the Railroad Commission of Texas:

"The weighted average pressure of the entire Panhandle [fol. 5173] Field in July, 1940 was 318.33 pounds per square inch as compared with an average pressure of 323.72 pounds in July 1939, during which period a total of 564,285,297 M.c.f. of dry gas was produced with a corresponding pressure drop of 5.39 pounds per square inch."

Q. The corresponding figure in Column 3, "Pressure Loss, Pounds" for the period 1939 to 1940 would have been 5.39 pounds, is that right?

A. That is right. The total of the two years add up to 19.33 pounds, instead of the 19.35 shown for the same two-year period in Column 3, Page 10, Exhibit 42.

Mr. Culton: While you are on it, will you see if there is any difference in the increase in acreage used in 1940 from that used in 1939? You will probably find that in connection with the East Field in 1940.

The Witness: It will show on the total field, also.

Trial Examiner: A 10,000-acre increase?

The Witness: Yes, they added 10,000 acres of high pressure in 1940, which changed the picture.

By Mr. Littman:

Q. Well now, were these two figures which you just mentioned of 13.94 pounds of pressure loss for the year 1938 to 1939, and 5.39 pounds for the year 1939 to 1940, both erroneous, or what? A. No.

[fol. 5174] Q. They were both all right?

A. No, it is, as I said, the 1939 figure which was in error, and it was straightened out in the year of 1940.

Q. Now, you say the 5.39-pound figure is wrong?

A. Yes, sir. It is wrong. So is the 13.94-pound figure. Added together, they will be correct.

Q. Well, isn't this situation typical of the inaccuracies which are bound to creep into these determinations of pressures, rock pressures, for the various years?

A. You say are they not what?

Q. Are typical.

Will you read the question back, please?

(Whereupon, the question indicated was read by the reporter.)

The Witness: No, I would say they are far from typical. The Railroad Commission of Texas has a tremendous job upon their hands and they do it in very good shape.

It just so happened that this one year they did draw the pressure isobar at the wrong place and after they found out that they had made this error, they came back and corrected it the next year.

By Mr. Littman:

Q. Now, will you read from any report of the Railroad Commission of Texas where the Commission has stated that it had been in error in computing the rock pressures [fol. 5175] for that year, for 1940? A. They weren't in error in 1940.

Q. Well, 1939 to 1940.

A. I doubt if they published it, but if you want to have me show the different number of acres weighted with the various pressures, it can readily be shown.

Q. Well, has the Texas Commission ever stated that they have made an error in the determination of their 1939 to 1940 rock pressures?

A. No, here is what happened: Somebody got the idea that there was a group of unproven acreage that belonged in one pressure class and so they placed it in that pressure class.

Then, a well was drilled and the pressure proved that the man who thought that bunch of acreage should have been in that class was wrong, so the next year it was placed back in between the pressure bands, where it should have been. The drilling is what straightened it out.

Q. I hand you a copy of the 1940 Report of the Railroad Commission of Texas and ask you to read where marked in the first paragraph of Page 5, and I ask you whether that statement will refresh your recollection of the situation.

Mr. Culton: You are talking about something entirely different from that.

Mr. Littman: That is what we want to find out. We want to be straightened out if we misunderstand, and I am sure this witness wants to be straightened out, if he mis-[fol. 5176] understands.

The Witness: Yes, I think that describes it. Would you like me to read it?

By Mr. Littman:

Q. I wish you would, please.

A. (Reading) "The weighted average pressure of the East Field in July 1940 was 247.68 pounds per square inch as compared with an average pressure of 242.34 pounds in July 1939. The reason for this pressure increase of 5.34 pounds was two-fold: First, the area of the East Field was increased by approximately 10,000 acres including a new well, the McLean Gas Company's C. H. Biegel No. 4 in Section 63, Block 23, H. & G., N. Survey, Gray County, which has a rock pressure over 400 pounds; second, an area of approximately 20,000 acres which, heretofore, had no control, was carried in the 250 to 300 pound contour, was proven to have a pressure over 300 pounds by the drilling in by Lone Star Gas of their J. A. Fowler wells No. 1 and 2 in Section 118, Block 23, H. & G. N. Survey, Gray County.

"From July 1939 to July 1940 a total of 39,667,071 M.c.f. of sweet gas was produced and a total of 24,476,412 M.c.f. of casing head gas.

"The daily average production for the East Field during this period was 18,380 M.c.f. of sweet and 66,875 M.c.f. of casing head gas.

[fol. 5177] "At the time of this survey there were 397 wells in the East Field having a total potential of 4,582,458 M.c.f., daily, and producing from a total area of 281,588 acres."

Q. That paragraph refers to the East Field, does it not? A. Yes.

Now, then, if you want to see what actually happened, I suggest that we get the 1941 rock pressure.

Mr. Culton: 1940.

The Witness: 1941 data; and see what the pressure on these wells, the one that came in at over 400 pounds, is at this time.

By Mr. Littman:

Q. I wouldn't care to go into that at this time.

Mr. Culton: May I call attention to the fact that this shows, does it not, that the pressure in the East Field in July, 1940 was 247 pounds, or over 5 pounds more than it was the year before, and yet during that period 39 million M.c., or 39 billion feet of sweet gas was produced and 24 billion feet of casing head gas produced and yet the pressure is up 5½ pounds.

Is that correct? From the statement you just read?

The Witness: 5.34 pounds.

Mr. Culton: Yes.

By Mr. Littman:

[fol. 178] Q. Now, you consider these figures of pressure loss in pounds shown in the table on Page 10, to be as you testified yesterday, accurate within one pound, up or down, is that correct?

A. That would cover the situation, yes, sir.

Q. And that applies to all of the figures shown on Page 10 in the column headed, "Pressure Loss, Pounds"?

A. Yes; and by giving one pound, I think that we are giving plenty of leeway.

Q. Now, Mr. Hinton, am I correct in understanding that you disregarded the first line embracing the period from beginning to August 1, 1935, for purposes of determining the rate of pressure drop as shown in Exhibit 135?

A. Yes, I did.

Q. And did use the data shown in the table on Page 10 in the lower four lines embraced in the period from August 1, 1935, to August 1, 1940?

A. Yes, sir, that is correct.

Q. And you plotted your line in the chart, Exhibit 135, then, from four points, each one of which was derived from each of the four bottom lines, is that right, as you explained yesterday?

A. Yes, but I didn't quite get what you meant when you said, the bottom line.

Q. I meant the bottom four lines on Page 10.
[fol. 5179]. A. Yes.

Q. Mr. Hinton, assuming that the production per pound of rock pressure decline had remained constant from August 1, 1935, to August 1, 1940, what would be the average rock pressure loss in pounds per trillion cubic feet, and the corresponding rock pressure loss in pounds for each of the four periods shown in your table on Page 10?

I understand that will require a calculation of approximately five minutes. I would like very much to have that calculation made:

A. I think I have already made it. I will check it. I believe it is 15.54. The total amount of production from 8-1.

Q. August 1?

A. No, I left out the estimated production there because that point was not used. It is from 7-1—from 8-1-35 to 8-1-40. It was 2,884,110,974. The total pressure drop for that period was 44.20 pounds. That gave an average of 15.33 pounds drop per trillion.

Q. Now, I also called for another set of figures which you apparently have not yet calculated.

I would like now to have the corresponding rock pressure loss in pounds for each of the four periods shown in this table. In other words, I would like to know what comparable "pressure loss, pounds" figure you would have [fol. 5186] in the third column for each of those four periods, assuming that the production per pound of rock pressure decline remained constant from August 1, 1935, to August 1, 1940.

Mr. Cullen: At what point? I can't understand it.

The Witness: I don't understand your question.

Mr. Culton: Constant at what point, the point shown on August 1, 1935?

By Mr. Littman:

Q. Assuming that there has been uniform production per pound drop of rock pressure throughout this period, this entire period August 1, 1935, to August 1, 1940.

A. If I get your question right, you want me to apply the rate of withdrawals for the year from July 1, 1936, to July 1, 1937, and for the year commencing July 1, 1937, to August 1, 1938.

Q. That is right, for each of the periods.

A. All right.

The pressure loss for the following periods based on the rate of loss for the per-trillion produced for the period commencing 8-1-35 to 7-1-36, and carried on down through the following years would give the following results:

For the period commencing 7-1-36 and extending to 7-1-37, and using a rate of decline that occurred during the previous year, the pressure loss in pounds would have been 7.46 instead of 7.95.

[40:5181] For the year commencing 7-1-37 to 8-1-38, and applying the same rate of decline as occurred during the year 8-1-36 to 7-1-36, the pressure loss would have been 8.41 instead of 9.39.

The application of the rate of decline which occurred from 8-1-35 to 7-1-36 to the year commencing 8-1-38 to 8-1-40 would have been 15.56 instead of 19.35.

Inasmuch as the figures originally on this page are Railroad Commission figures, I think that that readily proves that it would not be possible to carry on a constant rate of decline.

Q. Mr. Hinton, either you misunderstood me or I misunderstood you, but the figures that you have just given me are not the ones that I wanted you to calculate.

What I would like to have you calculate, as my previous question, I think, indicates it, is to apply the 45.33 rate to the production in each of the periods and give me the resultant pressure loss in pounds.

A. Yes, all right.

Q. Will you give me the first figure, so that we may make certain that you are getting what we want before you proceed with the rest of them?

A. Yes. If the average were applied over the entire period, there would have been a pressure decline for the year commencing 8-1-35 through 7-1-36 of 8.53 pounds instead of 7.51.

[fol. 5182] Q. You are getting the figures that we want. Now, will you proceed with the balance of the figures?

A. Yes, I will be glad to, because it is going to convince you, I believe, that you couldn't anyways near apply an average pressure throughout the life of this field.

Q. I rather doubt it, Mr. Hinton, but I appreciate your zeal.

A. For the year commencing 7-1-36 to 7-1-37, the pressure drop, applying the average of 15.33 to the amount of gas produced, would have been 8.45 pounds instead of the 7.98 which was obtained from the Railroad Commission pressure reports.

• Applying the 15.33 to the production which was taken from the year commencing 7-1-37 through 8-1-38, the pressure drop would have been 9.55 instead of the 9.39 reflected in the data of the Railroad Commission report.

If the rate of 15.33 pounds is applied to the production which occurred for the period commencing 8-1-38 to 8-1-40, the pressure drop would have been 17.67 pounds instead of the 49.35 pounds which actually occurred.

Q. In other words, Mr. Hinton, if the production per pound of rock pressure decline had remained constant from August 1, 1935, to August 1, 1940, the corresponding loss in rock pressure would have been the pound figures which you just read into the record instead of those shown for [fol. 5183] each of the four periods shown in the bottom four lines, Column 2 of Page 10 of Exhibit 42, is that right?

A. If that would have been what the data indicated, those would have been the figures that would appear on this sheet in place of the typed figures which do appear.

Q. Now, in order to produce this constant rate of production per pound of drop in rock pressure decline, the figure of 7.51 pounds would have had to be varied slightly more than one pound upward, is that right?

A. That is correct.

Q. For the period August 1, 1935, to July 1, 1936?

A. That is right.

Q. And it would have required a variation upward from 7.95 pounds to 8.47 pounds to produce that same result for the period of July 1, 1936, to July 1, 1937, is that right?

A. That is correct.

Q. And it would have required a slight change from 9.39 pounds to 9.55 pounds to produce that result for the 13-month period, July 1, 1937, to August 1, 1938, is that correct?

A. That is correct.

Q. Now, for the last period, which embraces two whole years, from August 1, 1938, to August 1, 1940, it would have required a change downward from 19.35 pounds to 17.66 pounds, is that right?

[fol. 5184] A. That is correct.

Q. And is it not, also, correct that these new figures that you have read into the record are within the range of possibility of error and tolerance to which you alluded in your testimony today and yesterday, is that correct?

A. That is correct. However, there is always this to keep in mind, that the errors which occur in this type of work are largely compensating errors and are not errors that are multiplied.

Therefore, the type of error that will creep in one way will be counteracted by an error that will creep in the other way.

Q. But you can readily understand, can you not, Mr. Hinton, that the slightest deflection in these pressure-loss figures reported by you in the table on Page 10 might very, very well have produced and would produce a uniform production per pound drop of rock pressure in the Panhandle Field, is that right?

A. I would say that errors would influence it. They would have to be errors of greater magnitude than slight.

Q. Well, errors as slight as one pound per year, up or down, within the range of tolerance suggested by you, would produce a uniform production per pound drop of rock pressure in the Panhandle Field, is that not correct?

A. Yes, but I am not conceding, and I have not con-[fol. 5185.] ceded, that there would be errors in a magnitude of greater than 5 percent.

Mr. Culton: And would you expect them all to be one way?

The Witness: No, sir.

By Mr. Littman:

Q. Well, these new figures that you read into the record are not all one way, either, are they, Mr. Hinton? Some of them vary upward from the figures that you used and one, at least one of them for the two-year period varies downward, does it not?

A. Anytime that a series of figures of that nature is taken, beginning with a low number and ending with a high and then an average, is struck, naturally, when the average is applied, the commencing will be higher than the low and the ending will be lower than the high. That is very simple arithmetic.

Q. Well, regardless of the fact that, according to your testimony, there is a tolerance for error and a possibility of error, one pound either way, up or down, in these pressure-loss figures in the table on Page 10, and yet you applied those data literally in arriving at the rate of production per pound of rock pressure decline, did you not? Can you answer that yes or no?

A. Yes, I did. I will tell you why, it is because it came so close to checking.

[fol. 5186] Now, if these errors were creeping in, these points would not fall in nearly as straight a line, because the error would take it out of the realm of the straight line. That is on the curve produced on Exhibit 135.

Q. How do you know, Mr. Hinton, that the production per pound of rock pressure decline in the future in the Panhandle Field will proceed at a decelerating rate?

A. I don't know it, but past performance leads me to believe that it will.

Q. But you cannot vouch for any such thing, can you?

A. I couldn't vouch for anything in the gas field or around the gas wells, because we might have an earthquake down in that region that would shift the formation that would ruin the field overnight.

Q. But, Mr. Hinton, am I correct in stating that the experience upon which you are basing this deceleration of production for each successive pound drop of rock pressure in the Panhandle Field was taken from the literal application of the figures shown in the bottom four lines of the table on Page 10, covering a period from August 1, 1935, to August 1, 1940?

A. Yes, that data was used; and if you or anyone else can direct me to a better source of data, I would be highly appreciative.

Q. Well, if the data were accurate to the nth degree, [fol. 5187] both as to production and as to pressure loss in pounds, there is a great possibility, is there not, Mr. Hinton, that the indicated production per pound drop of rock pressure in the Panhandle Field would proceed at a uniform rate in accordance with the application of Boyle's Law? Is that not correct?

A. That is correct, but inasmuch as Boyle's Law cannot be applied, we still find that we have a uniform rate, due to the fact that the pressure points fall on a straight line.

Q. Now, assuming that the Panhandle Field is a tight container and assuming that the production and rock pressures in that field have been accurately determined from the beginning, should there be any substantial deviation from Boyle's Law of gases?

A. No.

Q. What is your answer?

A. No.

Q. And under these circumstances, the production per pound of rock pressure decline would be constant from the beginning?

In other words, there would be no acceleration or deceleration?

A. That is absolutely correct.

[fol. 5188] Q. Now, what reasons, in view of your answer to my last question, do you ascribe for the purported decelerating production per pound of drop in rock pressure in the Panhandle Field as indicated by you on Page 10?

A. Two things, principally the absence of the fourth dimension in the weighting of the field and the length of

time that is required for gas to flow from areas of higher pressure to areas of lower pressure.

Q. Well, how does that affect the over-all picture? Didn't you consider the Panhandle Field as a single reservoir?

A. Yes, but not a reservoir that is entirely alike throughout its area. There are great differences in the thickness of pay in the Panhandle reservoir, and if all of the wells that have been drilled in the Panhandle Field now had been drilled on the marginal acreage and on producing formation of thin pay, the remaining amount of pressure that would be observed would be far less than the average which we do observe.

Now, it is a fact that the weighting of this acreage does not give consideration to the total thickness of pay, but gives the same value to the marginal acreage that has only a very thin pay section as that of the pay section which is many times that thickness.

Therefore, when it is just weighted with the horizontal weighting only, the picture is not correct.

[fol. 5189] Q. Well, the variation of the thickness would affect the pressure reading, would it not?

A. That is correct, and as I have said, if you would move the rate of withdrawal over to the areas of thin pay, most of them would long ago have been abandoned if they were separated from the main field.

Q. But, the variation in the pay thickness does not affect the application of Boyle's law, if the data is correct?

A. Then, I am telling you that there is a length of time required for this gas to flow from an area of one higher pressure to an area of lower pressure.

Q. But, Mr. Hinton, the data that you used, to wit, rock pressure readings, is subject to the same fallacy to which you have just alluded a moment ago, is it not?

A. That is correct. If it were not, why, then, the average pressure decline for trillion feet of gas would remain constant, but it is proven that there is a constancy existing.

Q. You mean a constancy in the error? A. Yes.

Q. And you are, in reality, banking upon the consistency of the error in these readings through the years?

A. Yes.

Q. And your estimate of a decelerating rate of production for each successive pound drop of rock pressure decline is bottomed greatly upon your banking that the errors [fol. 5190] in these rock pressure readings will continue in the future as consistently as you claim they have occurred in the past?

A. Yes. I feel that is what is going to happen, Mr. Littman, and I believe that right now that is the only one thing that you can find that will check as closely in the Panhandle Field as that data which has been plotted upon Exhibit 135.

When I make that statement, I believe that I can say that I have put in probably as many hours on this problem as anyone else that worked on the production end of a natural gas company operating in the Panhandle Field.

Q. By the way, you have what appears to be a mathematical error in your table on Page 19. Will you ascertain whether the figure which appears on the bottom line under the heading "Indicated Virgin Content (Trillion) of 24,609" is correct?

A. Yes, sir, I am .07 of one million cubic feet of gas off.

Q. What is the correct figure?

A. 39,556,524.3.

Mr. Culton: He means the 24,609. To me it looks like it is too low.

The Witness: I thought you said the production.

By Mr. Littman:

Q. I wouldn't be that technical. I was referring to the column at the extreme right-hand side. What is the correct [fol. 5191] figure? A. 25,609.

Q. Instead of 24,609? A. That is right.

Mr. Culton: That doesn't affect any of the other computations, though, does it?

The Witness: No, sir.

By Mr. Littman:

Q. Now, as you have already explained, you did not utilize any of the data for the ten-year period from 1925 or 1926 to August 1, 1935, which is shown in the first line of your table, isn't that correct? A. That is right.

Q. You threw away the ten years and used the remaining 5 years?

A. I would rather have five good years than ten bad ones, yes, sir.

Q. What is bad about it?

A. Unknown quantities.

Q. Estimates? A. Estimates.

Q. Well, weren't those estimates checked by you and investigated by you as to accuracy?

A. Right, and to the point I neglected to use them in my work there because, while I feel that they are very good [fol. 5192] estimates, they are not of sufficient accuracy to use in this type of mathematical calculation for the purpose that this has been used.

Q. Well, they are the most accurate figures that could be obtained for the ten years, are they not?

A. That is right.

Q. Well, suppose you tell us how inaccurate these figures that you show in the first line are?

A. I don't know how I could show you that.

Q. You can't possibly know how inaccurate they are, can you? A. No, sir.

Q. If at all? A. No, sir.

Q. Well, now, if you had used the data shown in the first line on the Table on Page 10, Exhibit 42, what effect would it have had upon your line on the chart, Exhibit No. 135, showing the rate of pressure drop from 1935 to 1940?

A. It would have lowered the rate of decline slightly, that is, the increasing rate of decline.

Q. In other words, this line shown in the chart, Exhibit No. 135, would have declined less and would have more closely approximated a straight line, straight horizontal line, is that right?

A. Yes, and the line would not have passed through the [fol. 5193] points of better-known data as closely as they do.

Q. Now, I note that you have plotted that point representing the end of the ten-year period on this chart, which has been designated as Exhibit 135, have you not?

A. Yes, sir.

Q. Why did you put that point at the end of the ten-year period?

A. Because that is where it belonged in reference to the total withdrawal of the field.

Q. Mr. Hinton, isn't it a fact that it would more properly belong along toward the center of the ten-year period?

A. No, I should say not. Then there would be a great error.

Q. The point that you plot here is at the end of the ten-year period, is it not? A. Yes.

Q. And your graduations along the bottom of the chart are in trillions of cubic feet, are they not?

A. That is right. That is used to express the total accumulated withdrawal from the field in trillions of cubic feet.

Q. Then, you are certain that it would not have been more proper to plot that point at the mid-point in order to give a proper weighting to the time element involved in producing the slightly in excess of 5 billion M. c. f. in the ten-year period?

[fol. 5194] A. I believe that the best way to answer that would be to call your attention to the calculation which you had me make in Column 3, Page 10 of Exhibit 42.

You will notice that by the application of an average figure that there is an error which creeps in on both ends of this series of calculations.

Q. Mr. Hinton, don't these points that you have plotted on this chart, Exhibit No. 135, represent the average pressure drop per trillion cubic feet withdrawn from the Panhandle Field?

A. The average pressure drop?

Q. Yes.

A. Yes, at the various stages of withdrawal from the entire field.

Q. And that average is calculated over a period of time, is it not?

A. Yes.

Q. And represents an average of the period of time covered by the production, is that right?

A. That is right. Each year as the weighted averages are established, the amount of pressure drop is then obtained and that, along with the total amount of gas pro-

duced will show the number of pounds required to produce a trillion feet of gas, if that rate were to continue throughout the time that a trillion feet would be produced. [fol. 5195] Q. Now, this average drop in pressure was computed by taking the average pressure over the ten-year period, was it not, for your first point shown in the chart?

A. No, sir, the first point shown on the chart that was used was the number of pounds that was required to produce a trillion feet of gas when the total withdrawal from the field had been the amount shown of, I believe it is, 5 trillion 800 billion cubic feet of gas.

Q. I am not talking about that one, I was talking about the first one which covers the ten-year period from 1925 to 1935.

Now, doesn't that one represent the average of the data over that ten-year period?

A. Yes.

Q. And the other points, also, represent the average of the data over subsequent periods?

A. I see what you are getting at.

Q. Now, do you see what I mean?

A. And if we would place it out here, then it would become most convincing that it could not be used in the making up of this graph.

Q. Well, Mr. Hinton, do you now say that the proper place at which to plot those points is somewhere in the center of the period, rather than clear at the end of each period?

A. It really doesn't matter. I cannot see that it would [fol. 5196] make any difference whether you would put them in at the middle or at the end.

Q. Well, suppose you plot the first point, which represents the first line on Page 10, at a point which represents the average production rather than at the end of the ten-year period.

A. Well, could we do this roughly, or do you want me to do it most accurately?

Q. Well, suppose you do it approximately for all practical purposes.

A. I think I can show you here what will happen. This dot (indicating) will be moved up to here (indicating) and

this dot (indicating) will be moved up to here (indicating), and this one up to here (indicating) or, in other words, the dots will slip up or down and the line will pass through them.

The slope of the curve will not be altered by the changing of the plotting of the points.

Q. Suppose you give us the point at which these various points would be plotted upon the basis that I suggested, and I think you had better do it accurately.

Now, I would like to have you do it for the five points, all five.

A. O. K.

Trial Examiner: This must be charted, or it will be as meaningless as the last questions and answers.

[fol. 5197] Mr. Littman: I have just that in mind and we want the witness, therefore, to put the points on here in ink so that they may show in the exhibit.

The Witness: Now, will you tell me at what points you want these plotted? I am not sure that I understand just exactly how you want them.

Mr. Culton: For how many years do you want it plotted?

Mr. Littman: I want them plotted at the proper points on Exhibit 135.

Mr. Culton: The field was brought in in 1918.

By Mr. Littman:

Q. I want these points to bear some relation to the time element which was required to produce the gas and not way down at the end of the periods.

I would like to have you weight the time element into the plotting of these points.

A. The time element is in here, Mr. Littman. It is in here by the fact that each of these points are plotted when the total withdrawal at a given date was that amount.

[fol. 5198] Q. Mr. Hinton, have you completed your plotting of the points?

A. Yes, not any too workmanship-like manner, but they are down there in sufficient accuracy to serve the purpose, I think.

Q. And you plotted the points close to the center of each of the periods, each of the five periods shown on Page 10 of Exhibit 42?

A. Yes, as requested by you. However, that is still not exactly accurate.

Q. Well, I understand you are not adhering to your original points, but you will agree, will you not, that a line drawn from the five new points that you have plotted here at my request would have the effect of making the line a more nearly horizontal line than the sharply ascending line which you now have on Exhibit No. 135. Is that right?

A. On the contrary, plotting the points in the middle of the period as requested by you, shows that the acceleration is somewhat accented.

Q. Now, I am talking about five points, giving effect to the first point as well as to the other four.

A. Well, I have placed those points on there exactly as you requested. However, if they were to be placed properly, it would have to be done by interpolation.

That is, we would have to find out what percent of this gas was produced at a certain rate; each certain rate, see, and the point would be governed by the percentage that the amounts were produced at those rates.

Q. Mr. Hinton, will you please state the rate of rock pressure decline for the first M. c. f. of the production figures shown on your table on Page 10?

Mr. Culton: The first M. c. f.?

By Mr. Littman:

Q. The first M. c. f. out of the 1,152,514,747 M. c. f. figures shown at the bottom of Page 10 in the column headed, "Production, M. c. f.", and the rate for the last M. c. f. of that figure.

A. No, I cannot and I don't think anybody else can.

Q. Well, it would be different for each, would it not?

A. That is right.

Q. What does your chart show, Exhibit 135?

A. It shows that there is a difference and the amount of pressure required to produce the first M. c. f. of the amount of 1,152,418,747 M. c. f. would be different for the production of the first M. c. f. than it would the last of that amount.

Q. And yet you plot your point at the end of that period, do you not, rather than in the center of the period?

A. I did do that, and I think that it gives an answer [fol. 5200] that is just as accurate as plotting it in the middle, because in order to plot that figure in the middle, it would be necessary to know what the value of each pound of pressure was for each million feet that was produced during the time that that total amount was produced.

Therefore, it would be next to an impossibility to place that point right. If you placed it in the middle of the period, you would be just as much in error, in all probability, as by placing it at the end.

Q. Well, you know you are in error when you place it at the end, don't you?

A. And I would also—

Q. (Interposing). Is that right? You know you are in error when you plot your point at the end of the entire period?

A. Not for the purpose for which it was plotted.

Q. Isn't it a fact that the rate of drop at the beginning of the period, which I just mentioned, for the 1,152,000,000-odd M. c. f. at August 1, 1938, was 15.1 pounds, as shown by your chart, Exhibit No. 135?

A. For what period?

Q. Well, for August 1, 1938.

A. No, I do not know that. That is the point which you asked me to place upon this chart by dividing the production for that period.

[fol. 5201] Q. I am asking you whether or not the rate at the point at which you begin the period for the production of the 1,152,000,000 M. c. f. is the rate of 15.1 pounds.

A. No, I don't think it is.

Q. Isn't the rate of 15.1 pounds, which I just gave you, the rate which applies to, and which is plotted for, the 6 trillion 929 million 385 thousand 631 M. c. f. that is produced in the Panhandle Field, according to your chart, Exhibit 135?

A. Will you point to the point on the chart which you have in mind? You asked me to divide those periods of production and I did so and in so doing, I got a different total accumulated withdrawal.

The total accumulated withdrawal at that time, instead of being 6,929,385,631, is, actually, 6,617,923,050 M. c. f.

Q. Where did you secure that last number?

A. By taking the total accumulated production and dividing the gas that was produced for the period 7-1-37 to 8-1-38 by two, and then adding that half to the previous accumulated withdrawal.

Q. Suppose you tell me what pound decline rate is indicated when the 6 billion 929 million 385 thousand 631st M. c. f. is withdrawn from the Panhandle Field, according to your chart, Exhibit No. 135?

A. The rate of pressure required to produce one trillion [fol. 5202] feet of gas from the total cumulative withdrawal of 6,929,385,631 M. c. f. is, as close as I can read it, 15.08 pounds.

Q. Now, will you state the rate which will be required to produce the 8,081,804,379 M. c. f., as indicated by the line on your chart, Exhibit No. 135?

A. That is 16.79 pounds.

[fol. 5207]

Cross-Examination

By Mr. Littman:

Q. Mr. Hinton, you have, no doubt, had an opportunity, over the week-end, to reflect a little about the five original [fol. 5208] points designated, "1935, 1936, 1937, 1938 and 1940", respectively, which you plotted on the chart identified as Exhibit No. 135?

A. Yes, among other things, I have given that some consideration.

Q. And perhaps you have given some consideration to the line originally drawn by you on this chart through these five original points?

A. Yes, sir, I gave a great deal of consideration to it before I originally drew it.

Q. Now, what do you say with respect to the original five points plotted on this chart? Do you still feel that

those five points correctly represent the plotting of the data shown in Exhibit 42, Page 10, in the table?

A. I certainly do. However, there might be something misleading about the way that I had the headings or the titles shown on Exhibit No. 135.

Q. What is misleading about them?

A. The pound decline, weighted average pressure, reflects the apparent number of pounds that were needed at the ending of each withdrawal period, and I believe that I have somewhere on here the word, "average," yes.

The average might be misleading, in that it would probably lead anyone who had not gone through the problem, to believe that the points should be plotted midway between the withdrawal points instead of at the end of the [fol. 5209] withdrawal points.

Q. Well, there is only one correct way, mathematically, to plot these points and to draw the line. Is that right?

A. That is right.

Q. And the calibrations, reading up and those reading across, should meet at the proper place, should they not?

A. That is right. And I—

Q. Now, inasmuch as there is only one correct way, mathematically, to plot these points and draw this line, I would like to have you state whether or not the way that you have done it in Chart Exhibit 135 is correct, mathematically, or not?

A. In the solving of my problem, it is correct.

Q. Mathematically correct?

A. Yes.

Q. Now, you testified—

Trial Examiner: (Interposing) Mr. Littman, if you are going to another line of inquiry, Mr. Hinton should have an opportunity to make the explanation he started to make.

Mr. Littman: Very well.

By Mr. Littman:

Q. Do you have an explanation to make of what you [fol. 5210] have said so far?

A. I just thought it might lend some clarity to the situation.

The amount of gas that is shown between the points plotted for the year 1938 and 1940—

Mr. Culton: (Interposing) You mean the years between the period?

Mr. Wheat: Between which years, so we can be sure?

The Witness: That commences with a period which starts the last five months of 1938 and includes the first seven months of the year 1940.

That represents a total amount of gas between those dates of 1,152,418,747,000 cubic feet, and the rate of pressure decline for that amount of gas was that which is shown at the end of the period.

It might be shown by extending a vertical line through the year 1938 and showing a horizontal line between those two points, more clearly the number of pounds required to produce a trillion feet of gas for the rate required for that period.

Mr. Littman: Will you read the last answer?

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. And what is the average rate for the period which you just mentioned?

A. I believe it is 16.78, as I remember. It will be shown— [fol. 5211] Q. (Interposing) We get 16.79, but there isn't enough difference there to quibble about.

A. No, I don't believe we could plot that close on that size paper.

Q. And, am I correct in stating that the center of that segment of the line which represents the production for the period which you just named does not pass through the average figure which you just gave?

A. Yes.

Q. On your chart?

A. It will, Mr. Littman, because, — keep in mind — the pressure decline is governed by the total cumulative withdrawal from the field.

At any point that you wish me to place on that chart, I will do so by applying the average rate of decline for that

five-year period and by interpolating and applying that factor to any given cumulative withdrawal during that period, it will fall on the line or very, very close to it.

Q. Well, the end of your line falls at the average point on this chart of 16.79 pounds, does it not?

A., Yes.

Q. Therefore, your midpoint of the segment for that period does not fall on the average, is that correct?

A. That is correct, that it would not be on the same [fol. 5212] vertical elevation as that point, because the total cumulative withdrawal at that time would have been lower.

As the withdrawal has been lower all the way through this field, we find that a smaller number of pounds has been required to produce the same amount of gas.

Q. Well, Mr. Hinton, I am afraid we will have to go through this step by step to show you that this line is not plotted mathematically correctly on this chart.

Now, you have testified—

A. (Interposing) Just a moment, Mr. Littman. What do you mean by "mathematically correct"?

Q. I mean there is only one way to draw this line and one way to plot these points, and that is in accordance with strict mathematics; you have not followed those mathematical rules in plotting those points and in drawing the line.

Mr. Wheat: Now, Mr. Littman, I think it is only fair to the witness for you to state what the rules are that you are mentioning before you state, in your opinion, that he has not followed the rules.

If you would state the mathematical rules you have in mind, I think the record would be much clearer.

Mr. Littman: I believe that all of that will be shown by the questions I am going to ask and I think I can explain better as we go along, exactly what I mean.

The Witness: Well, now, the method used in plotting [fol. 5213] this is a mathematical method and there is no question as to whether it is or isn't. The rate of pressure

decline is plotted against the various stages of withdrawal in that field.

By Mr. Littman:

Q. Well, let's go through the steps, Mr. Hinton, and perhaps we can show you definitely what we mean

Now, you have testified that the rate of pressure decline, indicated by your chart, Exhibit No. 135, for the 6,929,385,631st M. e. f.—

A. (Interposing) Wait a minute. Let me check that figure. For what period are you reading?

Q. 6,929,385,631st—

A. (Interposing) That should be 985,000, I believe. That is for the first seven months of 1938 accumulated? That is the total amount withdrawn at the end of the first seven months of 1938?

Q. No. I am sorry, it is the first M. e. f. withdrawn at the beginning of the period August 1, 1938; to August 1, 1940. Do you understand me?

A. Yes, but I believe, if you will check your figure, that you will find that the total accumulated withdrawal at that time was 6,929,985,630 M. e. f.

Q. Just a minute, we will check it.

Mr. Goodman: Would that be the addition of the figures in the second column on Page 10 up to 8-1-38?

[fol. 5214] Mr. Littman: That is right.

The Witness: Yes.

Mr. Culton: What is your figure, 6,929,985,000?

The Witness: There is evidently an error in the figures, because these are my basic figures, right here.

By Mr. Littman:

Q. We have checked our figure, Mr. Hinton, and find that the one which I read was right. If you want to check your figure again, you are at liberty to do it.

A. I am working from my basic figures and not the ones that are printed here. It may be that there is an error in these here.

Q. You mean there may be an error in your Exhibit 42 on Page 10? A. That is right.

Q. Well, we worked from the table on Page 10 of Exhibit 42.

A. I believe I have found it. The period from 7-1-36 to 7-1-37 adds up to 552,288,402. It makes very little difference in the calculation.

Q. Well, Mr. Hinton, that wouldn't make the correction that you just mentioned a moment ago?

Mr. Wheat: What correction do you mean, Mr. Littman?

Mr. Littman: Well, the correction he made represented a change of something like 600,000 M.e.f. and the one to which he has just alluded would only change the figure [fol. 5215] a few thousand.

By Mr. Littman:

Q: I agree that it will, in all probability, affect the final figure so slightly as to make no difference. May we, then, not accept as correct, for purposes of this line of questions, the figures shown in your table on Page 10 of Exhibit 42? A. Yes.

Q. All right. We will start again.

Mr. Culton: That is the aggregate as of August 1, 1938, the total?

Mr. Littman: I was just going to repeat the question again, Mr. Culton, to get back to our original trend of thought.

By Mr. Littman:

Q. You have indicated that the rate of pressure decline, indicated by your chart, Exhibit 135, for the 6,929,385,631st M.e.f. is 15.08 pounds.

A. I have .07, but again, that is a matter of a small difference?

Q. I was referring to your testimony of Friday, which appears at Page—

A. (Interposing) I worked those out and I wrote 15.07 [fol. 5216] down here.

Q. The transcript shows 15.08, but 15.07 is close enough.

Mr. Wheat: It doesn't make any difference at all.

By Mr. Littman:

Q. Pounds, of course? A. Yes.

Q. Now, you also testified that the rate of pressure decline, indicated by your chart, Exhibit 135, for the 8,081,804,377th M.c.f. is 16.79 pounds?

A. That is correct.

Q. Now, we have read the figure which represents the first M.c.f. produced in the period August 1, 1938, to August 1, 1940, and the last M.c.f. produced in that period.

A. No, you have not. You have read an average of those so indicated.

Q. Well, I am talking about the M.c.f. figures.

A. And the decline of the M.c.f. at that period is less than it is at the last, because the total cumulative withdrawal is different at that time.

Q. Mr. Hinton, I was simply trying to give a little resume of what is so apparent to us, that I thought it might be made even more apparent on the record; and I see that we are in trouble again.

Isn't it a fact that the 6,929,385,631st M.c.f. is the first [fol. 5217] M.c.f. that was produced in the period August 1, 1938 to August 1, 1940, which is shown in the bottom line of your Page 10 of Exhibit 42?

A. Yes.

And is it not a fact that the figure which I gave of 8,081,804,377th M.c.f. is the last M.c.f. produced in that period? A. Yes.

Q. That was all that I was getting at, merely summarizing that we have the first and last M.c.f.'s of that period.

A. I understood you to say that the pressure decline was the same in both cases.

Q. Very well. Now, the rate which your chart shows—now, we are speaking of your chart and the line and point on your chart—

Trial Examiner: (Interposing) Chart exhibit what?

Mr. Littman: 135.

By Mr. Littman:

Q. The rate of pressure decline which produced the first M.c.f. in that period was 15.07 pounds?

A. That is right. No, now just a moment there. You almost have me confused. That is not the rate at the first M.c.f., that is the rate that was indicated for the withdrawal of 622,925,161 M.c.f. that was withdrawn from 7-1-37 to 8-1-38 when the total withdrawal had been—

[fol. 5218] Q. (Interposing) Mr. Hinton, I am now endeavoring to ascertain the figure which your chart indicates.

A. (Continuing)—and, as I explained, probably the title on that chart could have been put on there to explain the result more clearly.

Q. Mr. Hinton, you have testified, have you not, that the rate of pressure decline, indicated by your chart, Exhibit 135, for the first M.c.f. produced in that period is 15.07 pounds. Is that not correct?

A. Yes, but I was in error, and I went on [the] explain why I was in error.

Q. You mean your chart is in error?

A. No, I mean that at the end of that period the amount of pressure required was [greater] than the 15.07 pounds, because that is a requirement for that total period and it would be lower at the beginning and higher at the end.

Q. That is exactly what we are trying to prove, that your points are not plotted where they should be, to-wit, at the midpoint of that production for the period, but I merely, at this stage of the proceeding, am asking you to tell me whether your chart, Exhibit 135, shows that the rate for the production of the first M.c.f. in the period 8-1-38 to August 1, 1940, is 15.07 pounds.

What is the total withdrawal at that point?

A. You mean for the beginning of the period?

[fol. 5219] Q. Yes.

A. The total withdrawal up to that point, up to that period, is 6,929,385,630 M.c.f. Now, the 31st M.c.f. would be the first M.c.f. produced in the next succeeding period commencing 8-1-38.

Q. I want you to tell me what your chart indicates is the rate of pressure decline for that first M.c.f.

A. The rate required to produce a trillion feet of gas, at a cumulative withdrawal total in the field of 6,929,385,634 M.c.f.—that is plotted on there as “9”, too, I believe, isn't it?

Well, anyway, the amount of energy required will be about .1410 of one pound beyond the figures shown for the preceding M.c.f. withdrawal.

Mr. Culton: Your figures are all based on decline for million cubic feet and not based on decline for cubic foot or per thousand cubic feet?

The Witness: It is very difficult to figure those on the M.c.f. basis, it would run into many, many decimal places.

Mr. Littman: Will you please read back his previous answer?

(Whereupon, the answer indicated was read by the reporter.)

By Mr. Littman:

Q. Mr. Hinton, didn't you just state a few moments ago that the rate would be 15.07 pounds?

[fol. 5220] Mr. Culton: He said that was per million, counsel; not per pound.

By Mr. Littman:

Q. Mr. Hinton, you did not give me the figure I wanted. I want the rate per trillion cubic feet for the time that the named M.c.f., which I gave you, is produced.

A. And that was 6,929,385,630.

Q. 6,929,385,631st M.c.f.—

A. (Interposing) The apparent rate required to produce the next trillion feet after the point just mentioned by you will be an increase of .141, 308 over the amount of pressure required to produce the previous trillion feet of gas before that point.

Mr. Littman: Will you please read the question to this witness?

(Whereupon, the previous question and answer were read by the reporter.)

By Mr. Littman:

Q. You understand I want the figure in terms of trillion cubic feet, which is the term that you use in this chart.

A. All right. The average pressure required to produce the trillion feet previous to the point referred to on the chart was 15.07 pounds. The average amount of pres-

sure required to produce the next trillion feet will be 16.48308 pounds.

Q. Now, did I ask you anything about the next trillion, [fol. 5221] Mr. Hinton? Can't you confine your answers to my questions? A. No, sir.

Q. Tell me at which point the M.c.f. that I gave you will show on the left of your chart, the calibrations, vertically.

What rate, calibrated on your chart, is shown for that M.c.f.?

Trial Examiner: Your remark was inappropriate, clearly.

The Witness: The amount of gas shown in this point, better referred to on the graph as the year 1938, Exhibit 135, expresses in pounds the amount of gas which is required to produce one trillion feet of gas when the total rate of withdrawal had been 6,929,385,000,000 cubic feet and the amount of energy which will be required to produce the next trillion is increased in proportion to the amount that has been required over the past years of field performance.

[fol. 5222] The curve shows quite clearly that the amount of pressure that will be required to produce the next trillion feet of gas will be increased by the amount of 1.141 pounds for the average amount withdrawn.

By Mr. Littman:

Q. Mr. Hinton, did I ask you to give me any figure of increase?

A. Well, Mr. Littman—

Q. (Interposing). Did I or did I not? You are not paying attention to the question, Mr. Hinton.

Mr. Wheat: Mr. Examiner, I would like to have the record show that it is our opinion that a remark of that nature is one for the Presiding Officer to make, rather than for counsel.

Mr. Littman: I am going to ask that that answer be stricken as not responsive.

Trial Examiner: Let me ask you a question here, Mr. Littman.

We are dealing with a very intricate and difficult record, Mr. Littman and counsel for the company. It is important, if the record is to be of any serviceable use when it is completed, that we avoid all possible confusion and unclarities.

I wish, therefore, to ask you at this point, Mr. Littman, what you think would be the smallest unit of production which can be related to a given pressure diminution.

This question is asked purely in my desire to have some [fol. 5223] agreement between us, if possible, as to units, so that we may not be talking about different things or misunderstanding each other.

Mr. Littman: A few moments ago this witness answered my question when he said that the rate of pressure decline indicated by his chart, Exhibit 135, for the first M.e.f. produced in the period August 1, 1938, to August 1, 1940, was 15.07 pounds. That was a correct answer and a satisfactory answer.

I later repeated the same question as a preliminary matter, to go on from there; that was a half-hour ago, and I have been getting all kinds of different answers for the [vary] same question.

Now, what I want to do is, purely, to get this witness to tell me, as he did about a half-hour ago, what the rate is in pounds stated down to one-hundredths of a pound and no further, which figures would be useful and appropriate for purposes of this proceeding.

It is only in that way, if your Honor please, that we can leave the first step that I am undertaking to establish.

Trial Examiner: Mr. Littman, this is not at all clear to the Trial Examiner. It probably is to you and your experts, but we have been talking about the production in pressure and the results from the production of a trillion feet of gas.

Now, as the Trial Examiner understands the question you have just posed, you asked for the decline which would result from the production of 1,000 cubic feet.

[fol. 5224] Mr. Littman: No, if your Honor please, I asked for the rate.

Trial Examiner: Let us go back then, to the question that I asked you a moment ago. What, in your judgment, is the smallest unit of production in thousandths of cubic feet which will permit an accurate computation of pressure reduction?

Can we get a starting point, so that we will be talking about the same thing from here on?

Mr. Littman: The rate, if your Honor please, applies to an instant.

Trial Examiner: Well, must we not approach that through a computation based on a given unit?

Mr. Littman: The unit which we are using is M.c.f.

Trial Examiner: A single thousand cubic feet?

Mr. Littman: That is right.

Trial Examiner: And it is your contention that an accurate computation can be made on so small a unit of production?

Mr. Littman: This witness, I believe, can make an accurate reading of his chart at the point at which any given M.c.f. is reached.

Trial Examiner: Is that true, Mr. Hinton?

The Witness: No, sir, Mr. Examiner. The points reflected on Exhibit 135 show the average number of pounds required to produce a trillion cubic feet when the total withdrawal from the field amounts to what is shown on [fol. 5225] the bottom horizontal chart, and in order to arrive at the pressure required for one M.c.f. it would be necessary to apply the fractional part that one M.c.f. is of one trillion to that pressure decline.

Mr. Goodman: I have the feeling that we are getting even more confused. I think that all that Mr. Littman is attempting to do is simply locate points of reference.

In other words, he has asked, "at a certain point, namely, of production, what is the pressure decline used?"

Now, that question, I take it, is impossible of answer, because it must be related to a certain quantity. In other words, you have to have two points of reference in order to get at the element of pressure decline, and I think that the witness and Mr. Littman are at cross purposes between these things.

Trial Examiner: Well, just picking up where you left off, Mr. Goodman, it was the Trial Examiner's understanding of the testimony that there would be an increase of one-and-a-fraction pounds in the pressure reduction to produce the next trillion feet.

Mr. Wheat: Is that correct, Mr. Hinton?

The Witness: Yes, that is correct.

I am truly sorry if I have not been understanding this question correctly, but it is necessary to bring in the previous and the following trillion feet of gas, to be able to answer the question which you asked, Mr. Littman.

[fol. 5226] By Mr. Littman:

Q: I am not asking you, Mr. Hinton, about the rate of change, or the change in rate, you see. I am asking you about a static thing, to-wit, the point on your chart where the calibration in rate of pounds running horizontally across your chart meets the vertical calibration of production.

Now, those two points meet, and all I am asking you is to state the spot on your chart where those two points meet for the production that I am giving you.

Now, do you understand me?

A. Yes, sir, and if I may refer you to Page 10 of Exhibit 42, from the pencil calculations which have been made to the right of that sheet, I feel sure that you understand that those are expressed in pounds decline per trillion cubic feet at the various stages of cumulative withdrawal from this field, and those are the points that are shown on Exhibit 135.

Q. In other words, the points which you show represent the average for each period, do they not?

A. They show the number of pounds required to produce a trillion cubic feet of gas when the total cumulative withdrawal from the field is that expressed on the bottom of Exhibit 135.

[fol. 5228] By Mr. Littman:

Q. Mr. Hinton, I believe you stated earlier today that the title of your chart was misleading, did you not?

A. Yes, sir.

Q. What title would you suggest for this chart, namely, the chart, Exhibit No. 135?

A. The title I would suggest would be as follows:

"The Rate in Pounds Per Trillion Cubic Feet Required to Produce the Previous Period's Production which are Plotted at the End of the Total Cumulative Withdrawals, at the end of Each Respective Period."

Q. Now, do you have anything further to say with respect to any other data that you have shown on this chart, particularly with reference to the five points which you plotted and the line which is shown thereon?

A. Yes, I think that the title of the vertical scale should not show to be an average.

Mr. Goodman: May I ask a question here.

Mr. Hinton, there has been a discussion off the record between you and Mr. Shattuck, in which you exchanged view concerning the correctness of Exhibit 135, is that so?

The Witness: Yes, sir, that is correct.

Mr. Goodman: And it has seemed to you that there was merit in the comments and suggestions of Mr. Shattuck, hasn't there?

[fol. 5229] The Witness: That is correct.

Mr. Goodman: And you have some corrections, then, that you want to make in that exhibit, isn't that right?

The Witness: Well, I expect that the way to clarify this matter, as a whole, would be to re-make this graph in conjunction with Mr. Shattuck, so that we could be sure that we

understand exactly what we are talking about so, as it is passed on to others to work upon, there will not be anything that is unclear about it.

Mr. Goodman: Now, we understand that this Exhibit 135 does not accurately represent what it purports to represent?

The Witness: It represents—

Mr. Goodman: (Interposing) Just answer my question. It does not represent what it purports to represent?

The Witness: Under strict interpretation, I would say that it does not.

Mr. Goodman: All right.

The Witness: The answer derived represents what I feel will happen.

Mr. Goodman: Do you think that you ought to make some correction in the exhibit to make it clear to everybody concerned?

The Witness: I would say additions, rather than corrections.

[fol. 5230] Mr. Goodman: Very well, but at the same time, the exhibit, in itself, you admit is not clear, and it should be clarified, is that right?

The Witness: From a strict engineering standpoint, I would say that is correct.

Mr. Goodman: All right.

Mr. Culton: May I ask a question here.

You had not prepared that as an exhibit in this case?

The Witness: No, sir, that was prepared for my own reference and, at the end of the preparation of this chart, I checked it by all of the other known data on the Panhandle Field, namely: Did it fit field performance?

I found that it did.

Did it fit the known geological data? I found that it did.

Therefore, I felt that the idea represented on this chart was of sufficient accuracy to be applied to the future of the field.

Trial Examiner: Is it your contemplation, may I ask of Mr. Hinton and Mr. Shattuck, that some modification or supplementation of this exhibit will be produced?

The Witness: I am most willing, for my part, to work with Mr. Shattuck to the end that it is perfectly understood.

Trial Examiner: Would it be practicable, if some re-drafting of this curve is made, to put the re-draft on the [fol. 5231] original sheet, using a different colored ink, perhaps?

Mr. Littman: It will be perfectly satisfactory to us if Mr. Hinton and the engineer of our staff, Mr. Shattuck, were to confer and prepare a new chart or to superimpose upon the chart, Exhibit No. 135, the correct reflection of the data shown in the bottom four lines of Page 10 of Exhibit 42. That would be perfectly satisfactory with us and may save considerable time.

Trial Examiner: It occurred to the Trial Examiner that the whole of the testimony would be perhaps more thoroughly understood if you do use the original and differentiate by variance of colors in connection with any revision which is made.

Mr. Littman: That will be satisfactory.

However, we want it distinctly understood that our collaboration with Mr. Hinton in this regard will simply be to the extent that we will undertake to work on a chart which will represent the data shown on Page 10 of Exhibit 42, and that we will not be bound by that table and the conclusions drawn therefrom.

Trial Examiner: You, of course, do not agree to accept Mr. Hinton's conclusions.

Mr. Littman: That is correct, and we do not agree to accept Mr. Hinton's basic data which appears in the table on Page 10 of Exhibit 42.

[fol. 5232] However, we are anxious that the chart, if it be used at all in this proceeding, reflect the data shown on

Page 10 of Exhibit 42 from which Mr. Hinton has drawn certain conclusions.

I do have one of two questions before leaving this chart, however, which I think would clarify the record on this point.

By Mr. Littman:

Q. Mr. Hinton, looking at the bottom line on Page 10 of Exhibit 42, am I correct in understanding that the average rate of pressure decline per trillion cubic feet for the production of 1,152,418,747 M.c.f. produced during the period 8-1-38 to 8-1-40 was 16.79 pounds?

A. The last trillion of the amount mentioned was.

Q. Your answer to my question is, then, "no?"

A. Yes, it is "no".

Q. That is what you testified to yesterday?

A. No, sir. The 16.79 shows what the pound loss was for the last trillion produced and not for the 1,152,000,000,000.

Q. How did you arrive at the 16.79-pound figure?

A. By finding out what the—

Q. (Interposing.) I mean the arithmetical method of getting at it. What did you divide into what, to get this 16.79 pounds? I think the figures are shown in the table on Page 10 of Exhibit 42.

A. I took the 19.35 weighted average pressure loss, in pounds, and divided into that amount 1,152,418,747,000 cubic feet.

[Vol. 5233] Q. And you say that the resultant figure of 16.79 pounds does not represent the average pressure drop per billion M.c.f. withdrawn in that period?

A. No, sir, that is for a trillion.

Q. I said, billion M.c.f. If you want to say a trillion cubic feet, that is all right with me, but tell me whether or not, in view of what you have just said, the 16.79 pounds represents the average pressure decline per trillion cubic feet withdrawn during the period 8-1-38 to 8-1-40?

A. Yes, sir, it does.

Q. Now, going to the fourth line of your table on Page 10 of Exhibit 42, will you give us the comparable figure, to wit, the average pressure decline per trillion cubic feet withdrawn during the period July 1, 1937, to August 1,

1938, in which period there was produced, as shown on this table, the amount of 622,925,161 M.c.f.?

A. Yes, that is the rate per trillion.

Q. What is the rate per trillion?

A. 15.07. I thought you mentioned the figure.

Q. The 15.07 figure you gave represents 15.07 pounds, does it not? A. Yes.

Q. Now, will you give us the comparable figure, to-wit, the average pressure decline per trillion of M.c.f. withdrawn in the preceding period as shown in Line 3 of Page [fol. 5234] 10 of Exhibit 42, to-wit, the period from July 1, 1936, to July 1, 1937, in which period there was produced the total of 552,281,402 M.c.f.

A. Yes. The pressure loss per trillion at that point was 14.39 pounds, and is applied back to that proportionate amount of a trillion produced.

A. By "at that point", you mean the average for the period? A. Yes.

Q. Now, looking at the preceding period shown in Line 2 of the table on Page 10 of Exhibit 42, will you please give us the average pressure decline per trillion cubic feet withdrawn in the period August 1, 1935, to July 1, 1936, during which period there was produced 556,485,654 M.c.f.?

A. The indicated pressure loss per trillion for that period is 13.50 pounds, and applies to that portion of the trillion produced.

Q. Now, will you give us the average pressure decline, in pounds, per trillion cubic feet withdrawn during the preceding period shown in Line 4 of your Table on Page 10 of Exhibit 42, from the beginning of the Panhandle Field to August 1, 1935, during which period there was produced, according to this table, the amount of 5,197,693,413 M.c.f.?

A. The indicated pressure loss per trillion for that period, as shown in this table, is 12.98 pounds.

[fol. 5235] Q. Thank you.

Now, looking at the most recent period, to-wit, the period August 1, 1938, to August 1, 1940, which is shown in the bottom line on Page 10 of Exhibit 42, and bearing in mind that you stated the average rate for that period was 16.79 pounds, is it not a fact that the rate per trillion cubic feet withdrawn applicable to the first M.c.f. withdrawn in that period was below the 16.79-pound figure which you gave as the average, and is it also not a fact that the rate for the

last M.c.f. withdrawn in that period was somewhat higher than the average rate of 16.79 pounds which you gave us?

A. I agree with you that that would be the case, because that is an average figure.

Q. Now, Mr. Hinton, am I correct in understanding that in drawing your line shown in Exhibit 135, you gave no weight whatever to the production from the Panhandle Field during the period from the beginning of production in that field to August 1, 1935, totaling 5,197,693,413 M.c.f., which is shown in the first line of your table on Page 10 of Exhibit 42? A. That is correct.

Q. Now, the amount of production which I just named for the period embraced by the beginning of production in the Panhandle Field to August 1, 1935, represents approximately what percentage of the total production from the entire field shown on your table on Page 10 of Exhibit 42? [fol. 5236] A. Approximately 60 percent.

Mr. Littman: If your Honor please, I would like to have marked for identification with the next exhibit number, a table which we have prepared entitled, "Acres Used in Determining Weighted Average Pressures of Texas Panhandle Field."

I might state that the source of these figures, as shown in the table, is the Annual Reports of the Panhandle Oil and Gas Field of the Railroad Commission of Texas for the years shown.

Trial Examiner: This table will be marked for identification as Exhibit No. 137.

(Exhibit No. 137 was marked for identification.)

By Mr. Littman:

Q. Mr. Hinton, are you familiar with the figures shown in the table which has just been identified as Exhibit No. 137? A. I am.

Q. Have you had an opportunity to check these figures?

A. Yes, sir. I have checked them and found them to be correct, as shown in the 1940 Report of the Annual Report on the Panhandle Oil and Gas Field, Railroad Commission of Texas.

Q. Now, am I correct in stating that the acreage figures shown in table for identification, Exhibit No. 137, represent

the acreage which was utilized by the Texas Railroad Commission in arriving at the pressure loss, in pounds, figures which you show in your Exhibit 42 at Page 10?

[fol. 5237] A. Yes. Those are the figures upon which the weighted average pressures are determined for the field in the annual reports.

Mr. Culton: Do you know whether those changes in acreage were in high-pressure or in low-pressure areas?

The Witness: No, sir. I have not checked the source of the acreage changes for this exhibit.

Mr. Littman: Could you do that from the reports?

The Witness: Yes.

Mr. Culton: You could not do it, though, to determine which pressure bands they were in could you?

The Witness: You could tell the number of acres that were determined to fall in each pressure classification.

Mr. Culton: Well, without knowing that, this table does not mean anything, does it, from a weighted average proposition?

The Witness: Yes, I think this table means something without that, because it does show the number of acres that have been included in the total field each year, and how they have been segregated into what is known as the East Field, the West Field, for both the sweet and sour areas.

Mr. Culton: I meant, in determining the weighted average, these figures would mean nothing unless you knew how much of it was in each of the pressure bands?

[fol. 5238] The Witness: No acreage figures mean anything until it can be determined into which pressure classification they fall.

[fol. 5240] By Mr. Littman:

Q. Will you please refer to Exhibit 134, which is one of your working papers, and which is entitled, "Past Production and Estimated Future Production from Panhandle Field, Texas".

You have Exhibit 134 before you?

A. Yes, I have the original of that exhibit.

Q. In Columns 5, 8, and 11, you show the total estimated future annual withdrawals from the Panhandle Field under what you have described as Conditions 1, 2 and 3, respectively. A. That is correct.

Q. And I believe you have testified that these figures shown in Columns 5, 8 and 11 control the slope of the curves designated, "A", "B" and "C" in your chart entitled, "Panhandle Field, Texas, Pressure Trend", Exhibit 133 for identification. A. Yes, sir, that is correct.

Trial Examiner: Your references to Exhibit 134 for identification, Mr. Littman, call for the cumulative columns. [fol. 5241] You say, "5", "8" and "11".

Mr. Littman: No.

Trial Examiner: They call for the annual—

Mr. Littman: (Interposing) For the estimated annual withdrawal column.

I might state that earlier in the record I requested that all copies of this exhibit should bear the numbers 1 to 13, inclusive, for each of the columns shown, reading from left to right, in order to facilitate the case.

Trial Examiner: The reason for the inquiry was that I wanted to know if each date had been numbered as Column 1.

Mr. Littman: That is right.

By Mr. Littman:

Q. Now, am I correct in understanding that Condition 1, which you sometimes refer to as Condition "A", shown in Column 5 of Exhibit 134, assumes that the rate of withdrawals from the Panhandle Field in the future will remain at approximately the 1941 rate?

A. That is correct, down to the year 1953, where there will, in all probability, be a drop-off in the annual rate of withdrawal. For the years following 1956, namely, 1957, 1958, 1959 and 1960, shown on here, are rates of withdrawal which will probably not be experienced but which were used to see what the pressure drop would be at those rates.

Up to 1956, I feel that that is approximately what the [fol. 5242] total withdrawal will be.

Q. Well, now, the curve designated as Curve "A" in Exhibit 133 reflects the figures to which you have just referred and which are shown in Column 5 of Exhibit 134 as "Estimated Annual Withdrawals" under Condition 1. Is that correct? A. Yes, sir, that is correct.

Q. And I note from your chart, Exhibit 133, which was a part of your working papers, the Curve "A" reaches 50 pounds of well head pressure for the entire Panhandle Field in the year 1958. A. That is correct.

Q. Now, am I also correct in understanding that if the annual rate of withdrawals, shown in the column to which I have referred, will be less than you estimated in each year, the effect would be to prolong the indicated life of the field and to extend Curve "A" beyond 1958 to the extent of the reduction of the annual withdrawal figure?

A. Yes, sir. The life of any gas field is governed by the rate of withdrawal.

Q. Now, Condition 2, which you sometimes refer to as Condition "B," and which is shown in Column 8 of Exhibit 134, assumes the same conditions as Condition "A" except that Panhandle Eastern will increase its rate of withdrawals in the future in accordance with the withdrawals shown in Schedule 5 of Exhibit 43 and in Exhibit 131, which [fol. 5243] reflects Mr. Morton's estimate of future sales for Panhandle Eastern. Is that correct?

A. That is a correct statement.

Q. Under this condition, the 50 pounds average well head pressure is reached, as shown by your Curve "B" in Exhibit 133, in what year? A. 1958.

Q. And is it a fact that the curve reaches a point slightly ahead of that reached by your Curve "A" in that chart?

A. Yes. By the term "ahead", it shows that the point of 50 pounds well head pressure will be reached in an earlier part of 1958 than will Curve "A".

Q. As a matter of fact, it would be only slightly earlier than Condition "A", is that correct?

A. That is correct, yes, sir.

Q. Now, Condition 3, sometimes referred to by you as Condition "C", represents the increased withdrawals of all companies in the field, including Panhandle Eastern and as estimated by you. Is that correct? A. That is correct.

Q. And the figures showing the annual withdrawals for that condition are shown in Column 11 of Exhibit 134?

A. Yes.

Q. And is it this latter condition which represents what you believe to be the actual condition to be expected in the field in the future?

[fol. 5244] A. That is correct. In all cases, in all columns mentioned the amounts shown after 1956 are for experimental purposes only, as I do not believe that our company will continue to take gas from that field after the well head pressure has reached the point shown.

Q. And in your opinion, is that, also, true of the other pipe line companies that operate in the Panhandle Field?

A. No, it is not, because the other pipe line companies have not, with the exception of the Northern Natural Gas Company, provided themselves with further reserves.

Therefore, in all probability, it will be necessary for the other major pipe lines to continue to take gas from the Panhandle Field long after the economical point has been reached by the Panhandle Eastern Pipe Line.

Q. Well, how long after that point, would you say?

A. That would be largely dependent upon the price that they receive for their gas.

Q. Well, we will probably go into that phase of the matter a little later. At this time I wanted to make certain that I understood your figures in Exhibit 134.

Now, under Condition 3, sometimes called Condition "C", when is the average well head of 50 pounds reached, as shown by your Exhibit 134 and as shown by the curve designated "C" in Exhibit 133?

[fol. 5245] A. At approximately the end of the year 1956.

Q. In other words, earlier than under Conditions "A" or "B"? A. Yes, sir.

Q. And the reason for that is simply because you are showing a greater withdrawal per year under Condition "C" than under Conditions "A", and "B"?

A. That is correct, yes, sir.

Q. Do I correctly understand your testimony to be that Panhandle Eastern will not be justified in further producing gas in the Panhandle Field after 1956?

A. As we see our problem today, we will not. However, we do not know too much about the Hugoton Field, and it may happen that it will be profitable for us to produce gas in the Panhandle at a well head pressure of 50 pounds.

more cheaply than we will be able to produce gas in the Hugoton Field at the pressures which we will experience from that field.

Q. Well, my question, Mr. Hinton, was primarily related to your written testimony which appears about the middle of Page 40 of your Exhibit 42, which reads as follows:

"Therefore, it is my judgment that Panhandle Eastern will not be justified in further producing gas from its reserves in the Panhandle Field longer than 15 years from the present."

A. That is as I see the problem today, yes, sir.

Q. And under Condition "C", you fully expect the [fol. 5246] weighted average well head pressure in the Panhandle Field to reach 50 pounds in 1956. Is that right?

A. The data which has been established leads me to believe that that is very close to correct, yes, sir.

Q. Now, is this true of all of the other natural gas pipe line companies which operate in this field?

A. No, it is not.

Q. In other words, you think that the other natural gas pipe line companies—and by that I mean companies other than Panhandle Eastern—will continue to operate and produce gas in the Panhandle Field after 1956?

A. Yes, but at a far greater cost than their cost of production is as of today.

Q. How long after the year 1956 do you expect the other pipe line companies to operate?

A. That would be a matter that would be entirely dependent upon the management of those companies and their chances of obtaining reserves to carry on their business elsewhere that were under investigation at the period when they approached that pressure.

There are many things that enter in, but without additional supplies from elsewhere, it will not be a great length of time for the major companies.

The local companies and the gasoline plants can probably continue to operate several years after the major pipe lines [fol. 5247] no longer take gas from this field.

Q. Well, looking at your Exhibit 134, in the last line you show that there will be no remaining rock pressure in

the year 1960 under any of the three conditions. Is that correct?

A. That is right, because if the rate of withdrawals were experienced that are put down here, that would be the case; however, I don't anticipate that those rates of withdrawal from 1956 to the period 1960, shown on Exhibit 134, will be experienced.

They were merely put down there to see where the problem carried us and see what might happen at those rates of withdrawal.

Q. Well, is it your testimony that the annual withdrawals shown in Exhibit 134 are correct under each of the conditions that you have described through the year 1956? A. Yes.

Q. Then, you are now stating that the figures that appear for the remaining years, namely, 1957, through 1960, are not the annual withdrawals which will be made under those conditions?

A. That is right. They were placed upon this set of calculations to see what would happen, what we could expect if those rates of withdrawal were experienced.

Q. Now, do I understand your testimony to be that the [fol. 5248] amounts of annual withdrawals shown in Columns 5, 8 and 11, of Exhibit 134 are the withdrawals which can be made from the field through the year 1956?

A. Yes, that is correct.

Q. Mr. Winton, we were referring a moment ago to natural gas line companies other than Panhandle Eastern.

A. Yes.

Q. Suppose I name a number of companies that operated in the field and you tell me whether your definition of natural gas pipe line companies includes at least the following companies:

Texhoma Natural Gas Company.

A. Yes, producing for the Natural Gas Pipe Line Company of America.

Q. Northern Natural Gas Company? A. Yes.

Q. Canadian River Gas Company? A. Yes.

Q. Lone Star Gas Company?

A. Yes, but I don't give as much weight to that as I do to the other companies, because it furnishes markets closer to the field than the other companies.

Q. Well, markets supplied by Lone Star in any substantial quantities are a considerable distance from the Panhandle Field, are they not, at least a hundred miles? [fol. 5249]

A. That is right.

Mr. Culton: That isn't very far, though, as compared with the others?

Mr. Littman: Well, Mr. Culton, perhaps you can tell me the distance from the east Panhandle Field to Dallas?

Mr. Culton: About 300 miles. Something over 300 miles.

By Mr. Littman:

Q. Would I be correct if I had stated 300 miles rather than 100 miles?

A. I don't think that Lone Star takes any great quantity of gas from the Panhandle Field for their Dallas market.

Q. I see.

A. It goes to Wichita Falls. That is their principal market.

Q. How far is Wichita Falls from the Panhandle Field?

Mr. Culton: Something over 200 miles.

By Mr. Littman:

Q. Is that correct?

A. I would imagine. I don't know exactly that. It is a little off my beat.

Q. You expect the Lone Star Gas Company to continue to operate in the Panhandle Field for some short time after the other large pipe line companies will have abandoned their properties? Is that right? A. Yes.

[fol. 5250] Q. Well, let's go on with my list.

Cities Service Gas Company?

A. Yes. Cities Service can also move from the Panhandle Field if [their] so desire, as they maintain a substantial reserve in the Hugoton Field.

Q. And Cities Service Gas Company is included within your category of natural gas companies, as you have described it in your testimony a moment ago?

A. That is correct.

Q. Consolidated Gas Company? A. Yes.

Q. United Gas Pipe Line Company?

A. I will have to check that one. I have a list of all of them. Well, go ahead. I will say yes.

Q. If you want to change that later, you are at liberty to do so. A. Yes.

Q. Do you have any others in mind or have I named the major pipe line companies that operate in the field?

A. It seems to me as though there is one that takes a sizeable amount of gas that has been left out, but I can't think what it is.

Mr. Culton: He hasn't mentioned the Denver Line, has he?

The Witness: Yes, Canadian River.

Mr. Culton: How about Consolidated?

[fol. 5251] Mr. Littman: I mentioned Consolidated.

Mr. Culton: You have covered them all, I think.

The Witness: The Panhandle Power and Light take a considerable amount of gas, too. It goes to Borger. In fact, there are 23 pipe lines taking gas from the Panhandle Field at this time.

By Mr. Littman:

Q. Now, the annual withdrawal figures which you have shown in Exhibit 134, under all three conditions, of course, include figures for these natural gas pipe line companies which I have named? A. Yes.

Q. As well as other withdrawals?

A. That is correct, yes, sir.

Q. Now, in 1956—and I presume your figures here speak as of the end of the year, do they not? A. Yes, sir.

Q. In 1956 you show under Condition "A", the rock pressure in the field will be 74.52 pounds.

A. The observed well head pressure.

Q. I meant the well head pressure rather than the rock pressure. Is that right? A. Yes, sir.

Q. And under Condition "B", the well head pressure, as of the end of 1956, will be 72.74 pounds?

[fol. 5252] A. That is correct, 72.74 pounds.

Q. And under Condition "C", 50.15 pounds?

A. That is correct, in all cases.

Q. And, of course, those well head pressures are predicated upon the amounts of annual withdrawals which you have set forth in your Columns 5, 8 and 11, respectively? Is that right? A. Yes, sir, that is right.

Q. And which amounts are those which you say can and will be withdrawn under the three conditions which you have described, through the year 1956?

A. Of course, I say that is right, with the qualification, instead of saying it will, I would again like to say it is an estimate and it won't be exactly this, but it is the best estimated figure that I can produce.

Q. It is your best judgment? A. Right.

Q. Now, let's confine ourselves, for the moment, to Condition 2, sometimes called by you Condition "B"; the annual withdrawal figures for that condition are shown in Column 8. Is that right? A. Yes, sir.

Q. Will you state how you arrived at the figures in Column 8 which are called, "Estimated Annual Withdrawal, Condition No. 2, in M.c.f."?

[fol. 5253] A. Yes, I merely took the market, which was assumed to be approximately correct, for the year 1941 for the total withdrawal from the fields, and I kept all other markets approximately as they were, or as they were, and added the amount which Panhandle would expect to take in addition to that amount under the anticipated load schedule.

Q. And the amount which was taken in the year 1940 from the Panhandle Field by all producers other than Panhandle Eastern, was 566 million M.c.f. Is that correct?

A. No, sir.

Q. Will you give me the correct figures?

A. 597,467 M.M.c.f.

Q. What was the figure for the year 1941?

A. It was partially an estimated figure based upon what was happening at the midyear, and taking into consideration the probable withdrawal for the next year and was estimated to be 610,000 M. M.c.f.

Q. Now, you haven't given me the figure I wanted, Mr. Hinton. I want the figure in the year 1941 which represents the withdrawals by all producers other than Panhandle Eastern Pipe Line Company in the Panhandle Field.

A. 1941 was estimated to be approximately 44 million M.c.f. by the Panhandle Eastern.

Q. Well now, will you give me the figures for all others than the Panhandle Eastern?

[fol. 5254] A. 566,000 M. M.e.f.

Q. Now, to that amount of 566,000 M. M.e.f., you have added the amount of production which you estimate will have been taken from the field by Panhandle Eastern for the year 1941. A. 44,000 M.M.e.f.

Q. Which gives you the amount of 610,000 M.M.e.f., shown for the year 1941 in Column 8 of Exhibit 143?

A. Yes, sir, that is correct.

Q. Now, am I correct in understanding that you followed the same procedure for all of the subsequent years, that is, the years subsequent to 1941 shown in Column 8?

A. That is correct.

Q. In other words, you assume throughout this column that all producers other than Panhandle Eastern Pipe Line Company will take out 566,000 M.M.e.f.?

A. That is correct.

Q. And to that annual sum you have simply added the amount which Panhandle Eastern will produce from the Panhandle Field, the total of which is shown for each year in Exhibit 131 in the third column. Is that right?

A. Yes, that is correct.

Q. Now, stating it another way, if we were to take the total of the figures shown in your Schedule 5 of Exhibit 43 and add those amounts each year to the 566,000 M.M.e.f. [fol. 5255] produced by others in each of the years subsequent to 1941, we would secure the same total which you show in Column 8 of Exhibit 134?

A. No, not exactly, because the amount of gas which is estimated to be used on the lease for the drilling-in of wells and maintaining wells varies through the latter years of that schedule.

Q. Mr. Hinton, that is not our understanding of the figures which you show in Column 8 of Exhibit 134.

According to our arithmetic, if you take 566,000 M.M.e.f. in each year shown in Column 8, and merely add to it the amount which you estimate will be withdrawn by Panhandle Eastern in increasing amounts through the years, as shown in the third column of Exhibit 131 and as shown in Schedule 5 of Exhibit 43, you will secure the total shown in Column 8 of Exhibit 134 for each of the years.

A. That could be correct, although I feel quite certain that the amount of gas that was estimated for lease use dropped slightly during the last few years.

Q. Do you want to test some of these figures and make certain about that before we proceed?

A. Mr. Littman, I believe that the total shown here would not be affected by that, inasmuch as it would be a total drop-off in any case, regardless of the purpose for which it was used.

[fol. 5256] Q. In other words, you are saying it wouldn't make any substantial difference, one way or another?

A. That is correct.

Q. Then, may we, for all practical purposes, state that your column 8 holds constant an annual figure of 566,000 M. M. c. f. through the years for all producers other than Panhandle Eastern in the Panhandle Field?

A. I think that we could, yes, sir.

Q. And by adding to that the annual amounts which you have estimated can and will be withdrawn under Mr. Morton's increased load estimate, we will then have the same total substantially as that in Column 8 of Exhibit 134?

A. That will be correct, yes.

Q. For each of the years?

A. Yes.

Q. Now, Mr. Hinton, another way of stating that situation is to say that all other producers in the Panhandle Field, other than Panhandle Eastern, will produce from the years 1941 through 1956, 100 percent of the amounts which were produced by those companies in the year 1941?

A. Yes. I believe the term "withdrawn" would probably be better than "produced," because we think of produced gas as metered gas and this is all non-metered gas, not all metered.

Q. That is perfectly all right for you, so far as I am concerned, to use the term "withdrawn." Perhaps it is more accurate.

[fol. 5257] Well, at any rate, we understand each other to the extent that Column 8 shows or reflects a condition under which, through the years 1942 through 1956 and in each annual period, all companies other than Panhandle

Eastern, are going to be able to secure 100 percent of the amount of gas which they were able to secure in 1947. Is that right?

A. That is correct.

Q. Now, looking at your Exhibit 131, which shows the same figures, substantially, as those shown in your Schedule 5 of Exhibit 42, I am going to ask you to give us the percentage of production by Panhandle Eastern in the Panhandle Field for each of the years 1949 through 1956, as related to the years in which Panhandle Eastern, according to your testimony, will be able to withdraw the annual maximum amounts, to-wit, the years 1945 through 1948.

A. May I see that exhibit?

Q. Now, before you do that, Mr. Hinton, let me get clear on the record that in 1945, according to your Exhibit 131, Panhandle Eastern will reach its peak of annual withdrawals.

A. That is correct.

Q. And that peak is 60 million M. c. f., is it not?

A. Yes, sir, that is right.

Q. And in 1946, the same amount will be withdrawn? [fol. 5258] A. That is correct.

Q. And the same is true in 1947 and in 1948?

A. That is right.

Q. Now, taking those annual production figures as 100 percent, I want you to relate to that maximum annual withdrawal the withdrawals which you expect Panhandle Eastern to take from the Panhandle Field, both produced and purchased gas, for each of the annual periods subsequent thereto.

Mr. Culton: Doesn't that all show on Exhibit 131 in the record now?

Mr. Littman: No, Mr. Culton, those percentage figures are related to the total take by Panhandle Eastern.

Now, I want him to relate the annual production in 1949, for example, to the annual production in the peak years 1943, 1947, 1946 and 1945, using the latter peak years as 100 percent.

The Witness: You mean, using the 60—

By Mr. Littman:

Q. (Interposing) Using the 60 million M. c. f. as 100%.

Do you have the figures for one year? In other words, I want to make sure that you are answering my specific question rather than have you go all the way through and then have to go back again.

A. Yes, I do. I will try to stick to specific questions. This is the percent of gas which it is estimated will be [fol. 5259] withdrawn for the year 1949, 91.67 percent of that which will be withdrawn in 1948.

Q. And 1948 is the peak year which you are using as 100 percent?

A. That is correct.

Q. That is, it is one of the peak years, I should say?

A. Yes.

Q. Now, will you go on down, and give us the percentage for 1950?

A. For the year 1950, we estimate that we will withdraw from the Panhandle Field 83.33 percent as much as during the peak years 1945 to 1948, that amount being 60 billion cubic feet.

Q. That is the latter amount, being 60 billion.

Mr. Wheat: What was the 1950 percentage?

The Witness: 83.33.

Do you want me to continue.

By Mr. Littman:

Q. Yes, sir.

A. For the year 1951, the amount estimated to be withdrawn from the company and purchased wells will be 75 percent as much as in 1948.

Q. Yes. This is for Panhandle Eastern?

A. Yes. For the year 1952, it is estimated that 66.67 percent of the amount produced during the peak years will [fol. 5260] be produced.

Q. Very well.

A. For the year 1953, it is estimated that there will be 53.33 percent of the gas withdrawn that we estimated could be produced in the year 1948.

For the year 1954, it is estimated that we will withdraw 36.67 percent of the total withdrawn in 1948.

In 1955, it is estimated that we will withdraw 16.67 percent as much as we did during the peak years 1945 to 1948.

In 1956 it is estimated that we will withdraw 11.67 percent of the total of 60-billion for the years 1945-1948.

Q. In other words, Mr. Hinton, it is your judgment that, from 1948 through 1956, Panhandle Eastern will be able to produce in the Panhandle Field less and less gas in each successive year, down to as little as 11 percent of the amount which it produced in 1948, one of its peak years?

A. Without making additional capital expenditures, that is correct.

Q. The capital expenditures which are contemplated to be made in order to produce the amounts of gas which you estimated will be withdrawn in the future years, as shown in Schedule 5 of your Exhibit 42 and as shown in Exhibit 132, are detailed in your Exhibit 42 from Pages 26 to 32, inclusive, for the five and a half-year period beginning in the middle of 1941 and extending through 1946 and in the total amount of \$7,147,219. Is that correct? [fol. 5261] A. That is correct.

Mr. Culton: Just a minute. That figure is hardly accurate. You are referring to the capital expenditures in both fields, are you not, \$7,000,000?

Mr. Littman: Yes, but, of course, the details of the Panhandle Field are shown on the pages that I just referred to, are they not?

The Witness: Yes, and they do cover a 5½ year span, but no capital expenditures are shown beyond that date and we certainly are not assuming that we can continue to take the amounts of gas that are set out here without making additional capital expenditures in addition to those shown.

By Mr. Littman:

Q. In other words, you fully expect that Panhandle Eastern will expend additional sums after the 5½ year period, to wit, after 1946, in order to obtain the quantities of gas which are shown in Exhibit 132. Is that correct?

A. Yes, there will be some. There will be no major items, however, as it would be very difficult to justify a

large capital expenditure at that period of the life of the field.

Q. In other words, Panhandle Eastern expects to spend for capital additions such sums and all such sums as may be economically expended in order to produce the amount of gas which you estimate in Exhibit 132?

[fol. 5262] A. Yes, sir.

Q. And which figures are reflected in Column 8 of Exhibit 134?

A. That is correct.

Q. In other words, your estimate so far as the Panhandle Eastern take is concerned is predicated upon all that can and will be economically spent in order to produce the amounts of gas which you have estimated?

A. That is correct.

Q. And the best that Panhandle Eastern can do in 1956 is to produce under those conditions only 11 percent of the quantities of gas which it has produced in 1948, one of its peak years. Is that correct? Can you answer that yes or no?

A. No, I can't answer it yes or no.

Q. Well, what do you say about my question?

A. I would say that it would be largely dependent upon what the Hugoton Field turns out to be.

Q. Well, if the Hugoton Field turns out to be something other than you have assumed it to be, that wouldn't have any effect upon your taking any more gas out of the Panhandle Field, would it?

A. It certainly would.

Q. Now, in 1956, according to your best judgment, under Condition "B" all the other producers in the Panhandle Field except Panhandle Eastern, will be able to [fol. 5263] withdraw 100 percent of the amount that they withdrew in 1948 and years prior thereto?

A. I would say that that would be substantially correct.

Q. And under Condition "C", it is your testimony that the other producers will be able to take even larger amounts than those shown under Condition "B." Is that right?

A. That is correct.

Q. Whereas, Panhandle Eastern, in 1956, according to your testimony, will be able to economically produce only 11 percent of the production which it secured in the peak year 1948?

A. Taking the acreage division in the field, and taking the operating cost, that is what we anticipate it will be in the Hugoton Field at that time.

I would then say it would be uneconomical for us to take larger amounts from that field if my estimates prove to be correct.

Q. Well, if it is uneconomical for Panhandle Eastern to produce more than 11 percent in 1956 of the amounts which it produced in its peak years, by what process of reasoning do you come to the conclusion that it will be economical for all the others to keep going at full blast right down through the year 1956?

[fol. 5264] A. It will be, for this reason, that the other major pipe line companies in that field now hold a far greater amount of acreage than does Panhandle Eastern, therefore, it will be possible for them to drill more wells, to take less gas out of each well, but on a whole, to operate at a higher pressure than we would be able to do in that field.

The companies that have not provided themselves with reserve acreage in other fields have designed their systems in such a manner that by cylinder changes they can lower the pressure on their system more than can Panhandle Eastern, and they have been operating at a lower pressure for some time.

Does that answer your question, sir?

Q. I believe in one part of your answer you said, "higher" rather than "lower" pressure.

Didn't you mean lower pressure? I believe you misspoke yourself.

A. I was thinking in terms of a compressor station and not the well head.

Q. I see. Then, it is your testimony, Mr. Hinton, that in 1956 these other producers, all of them other than Panhandle Eastern, will be able to economically produce at 100 percent of their 1948 production?

A. The question of economics is dependent upon the ceiling price of the gas. If we are able to carry on our development in such a manner that we are able to produce

[fol. 5265] gas at a lower cost than the other companies, that is our good fortune, and we have made provision for that very thing by obtaining a reserve in a field where we can expect to operate at higher pressures and on a more economical basis.

Q. Now, have you made any investigation of the economies of the operation of all the other natural gas pipeline companies in the Panhandle Field to ascertain whether they could economically withdraw any such amounts as 100 percent in 1956 of that which they withdrew in their peak years?

A. Not in detail, but I can tell you this, that the drilling programs of the other companies indicate, and if you would care to talk to them about it, they will substantiate it, that the number of wells that they are drilling now is with an eye to the future.

By that I mean that they are going to be forced to take a smaller amount of gas from each well, as years go on, and you can see what an orderly program is in my exhibit for the Panhandle Field.

In other words, when we have completed 15 more wells in the Panhandle Field, then we have drilled up all of our acreage field by delayed rentals.

The Canadian River, the Texhoma Natural Gas, have innumerable locations yet to drill.

Q. Well, have you made a study of how many wells these other companies would have to drill to get any such [fol. 5266] quantity of gas out of the Panhandle Field as those quantities which you show for the year 1956 in Exhibit 134?

A. No, not in any detail, but I do know this, they are going to be forced to produce gas under very undesirable conditions at great cost.

[fol. 5267] By Mr. Littman:

Q. Mr. Hinton, in the year 1956, under your Condition "B" in which year all other producers than Panhandle Eastern will be withdrawing gas at full blast, 100 percent of their peak years, what will be the rock pressure at that time, according to your Exhibit No. 134?

I mean, the well head pressure?

A. 72.47 pounds.

Q. And that is under Condition "B"?

A. Yes.

Q. And under Condition "C", under which condition, according to your testimony and this Exhibit 134, the producers in the field, all of them other than Panhandle Eastern will be producing even more gas than under Condition "B". Is that right?

A. Yes, that is right. That is, I assume that they will, and these figures are based upon that assumption.

Q. Well, is the assumption a correct one?

A. As nearly as I am able to forecast, it is.

Q. What is the well head pressure average throughout the Panhandle Field in 1956, under Condition "C"?

A. 50.15 at the places where the average rate of withdrawal has been experienced through the years.

Q. And notwithstanding the average well head pressure of only 50 pounds in 1956, you still expect all producers, other than poor Panhandle Eastern, to be able to get as much gas out of the field as they did back in the flush year of 1948, is that right?

Mr. Caltan: Do you mean "poor Panhandle Eastern" or "fortunate Panhandle Eastern"?

The Witness: That is what I was going to say. I would say, "poor other producers and fortunate Panhandle Eastern," because they are not going to be forced to produce gas at that pressure to stay in business, while the other companies are.

Now, if the other companies decide it is no longer economical to produce gas at these low pressures and they go out of business previous to this date, naturally, the life of our reserves will be extended.

However, if they build the Milwaukee line and that gas is taken from the Panhandle Field, our life will be shortened.

By Mr. Littman:

Q. All of that depends, does it not, upon the economics of the situation down around the year 1956 and along about that time. Is that right?

A. I would say, commencing in 1954.

Q. And if it is not economical for the producers other than Panhandle in the year about 1954 to spend the money which is required to produce the same amounts of gas in those years as they had back in 1948, why, then they, the other producers, would cease operations and the life of the field would be extended?

[fol. 5269] A. That is correct.

Q. And might they not, in the year 1954, for example, rather than spend these huge amounts for capital additions in order to take 100 percent of the amounts that they took in flush years, rather go ahead and produce less gas with a lower capital expenditure? Is that right?

A. No, I do not think that could turn out that way, Mr. Littman, because they have a certain area to serve and I do not believe that these gas companies will drop off certain areas and continue to serve others, major areas, I am speaking of.

Q. What is there to prevent these other companies from going into the Hugoton Field and supplementing their supply as Panhandle Eastern expects to?

A. The sad, small supply of available acreage which is now not held by development or delay rentals in bloc's of sufficient size to enable any major pipe line company to obtain acreage in the amounts that would be large enough to provide the necessary reserve for them to carry on the same volume of business.

Q. Have you made a detailed investigation of the available acreage in the Hugoton Field?

A. I am, I believe, about as familiar with it as anyone that goes down around the Hugoton Field.

[fol. 5270] Q. Are you the only company that operates in the Hugoton Field?

A. No.

Q. Name the other pipe line companies, natural gas pipe line companies that operate in the Hugoton Field that also operate in the Panhandle Field.

A. The Northern Natural Gas Company.

Q. Any others?

A. No, not that operate in the Panhandle Field.

Q. Northern Natural?

A. That is right.

Q. Well, the Northern Natural stands in very much the same position as Panhandle Eastern, does it not, in that it operates in both fields?

A. Well, they do not have as large a reserve in the Panhandle Field as we do.

I believe that your question would better be answered by saying that I would say that they were in the same category.

Q. Have you endeavored to ascertain how much horsepower would be required to produce anything like 618 million M. c. f. in the year—I beg your pardon—621 million M. c. f. in the year 1956?

A. No, I have not, because it would be a tremendous job and I know that it would run into many, many, many thousands of horsepower.

[fol. 5271] Q. And many, many, many millions of dollars?

A. Right.

Mr. Culton: Are you expecting that 600 million to all be carried out of the field?

Mr. Littman: Out of the Panhandle Field.

The Witness: No, but we know that the gasoline plants are going to continue to operate at probably the same volume as they are.

We know that it is going to take considerable gas to maintain the number of wells which will be then drilled in the Panhandle Field and the amount of gas which will be taken by pipe line companies at that time will have dropped off some, and I believe that of the total amount of 621 million M. c. f., of that amount 258,700 will be used by pipe lines.

By Mr. Littman:

Q. How did you arrive at that figure?

A. Because that is the amount of gas that I estimate to be utilized by pipe lines in the year 1956.

Q. What percent of gas is taken out of the Panhandle Field now by the major pipe line companies?

Mr. Culton: That calculation is all available now, Mr. Littman, if you want to put it in evidence. That is the tabulation you requested the other day, the breakdown.

Mr. Littman: Well, we will probably do so after examining it. I have not seen it yet, but I will be grateful if [fol. 5272] those figures are made available.

Mr. Wheat: It just came in.

The Witness: For the year 1940, the percent of the total withdrawal from the Hugoton Field which was used—

Mr. Culton: (Interposing) You mean the Panhandle Field?

The Witness: Or the Panhandle Field, which was used by pipe lines was 39.48 percent of the total.

By Mr. Littman:

Q. What year was that?

A. That was in 1940.

Trial Examiner: Is that all sweet gas, Mr. Hinton?

The Witness: No.

Trial Examiner: That includes the sour gas used for carbon black processing as well as the casing head production?

The Witness: It also includes casing head gas not treated, blown to air, which is an estimated figures, and the gas blown to air that is used in the drilling-in of wells and the maintenance of wells and testing of wells.

By Mr. Littman:

Q. Do you know what the percentage was for the first six months of 1940 as shown by the 1940 Report of the Texas Railroad Commission?

A. No, I do not. That will show on the 1940 Report, but will not give any allowance for the amount of gas which was estimated to be blown in the air.

[fol. 5273] Q. Now, you would have to know a number of things, would you not, to be able to tell whether or not it would be economical for the producers in the Panhandle Field, other than Panhandle Eastern Pipe Line Company, to produce the amounts of gas which you show under each of these Conditions "A", "B" and "C" in Exhibit 134 for the year 1956?

A. Yes, that is correct.

Q. And will you just enumerate the things you have to know to be able to tell whether or not it will be economical to produce that amount of gas?

A. I would have to know every item of expense that would be incurred by that company to operate so that I could determine whether the total cost of producing that gas added to the other operating costs would enable it to sell the gas at a profit.

Q. Now, did you do that?

A. No.

Q. And you would have—

Mr. Goodman: (Interposing) Can I ask a question?

Mr. Littman: Yes.

Mr. Goodman: Did you do that in respect to your own company?

The Witness: No. That is not possible to do at this time, because we do not know what it is going to cost us to produce gas at the pressures which will be experienced in those years.

[fol. 5274] Mr. Goodman: And to what extent, within your knowledge, was that done with your own company?

The Witness: Probably not in any great detail, because we have a safety valve, you might say, and that is due to the fact that when we get down to the point where our Accounting Department figures show it is no longer profitable to produce gas, we can remove our source of withdrawal.

Mr. Goodman: You indicate the Accounting Department has figures on this subject?

The Witness: I assume that there could be figures compiled to show what the operating costs would be through the years.

Mr. Goodman: Well, you spoke about how you would find out whether it was economical for the other companies to produce, and I asked you whether you could ascertain the economics of production or the economy of production for your own company, and you said "no",

and I asked you to what extent that had been done, if you knew, and you referred to the Accounting Department.

Now, does the Accounting Department, within your knowledge, have figures as to the extent to which it is economical to produce in the future from the Panhandle Field?

The Witness: No, because we do not know what the future price will be.

[fol. 5275] Mr. Goodman: That is all.

By Mr. Littman:

Q. You would have to know all of those things in order to make an accurate determination of the amount of production which would be expected from the Panhandle Field in, for example, the year 1956?

A. I feel that that is a statement that covers my idea.

Q. Have you ascertained how many wells would be required to be drilled in order to produce anything like 621 million M. c. f. from the Panhandle Field in the year 1956, at which time the well head pressure average throughout the field will be, according to your testimony, only 50 pounds?

A. No, I have not made a detailed estimate of that, and I think it will be rather difficult to make, inasmuch as a great deal of the undeveloped acreage is marginal acreage which will probably prove to have little value, and it will probably require a greater number of wells than if we would base it upon the present portion of the field development.

Q. Do you have any idea as to how many times as many wells that are now in the field will be required to produce that amount of gas which you indicate in the year 1956?

A. No, I have not made that study. It could be estimated from known data very closely. I would say that it would be in the neighborhood of some 3,000 wells.

[fol. 5276] Q. 3,000 additional wells?

A. Yes. That is a very rough estimate.

Q. How many wells are there now in the Panhandle Field?

A. I will have to refer to the last Annual Report of the Railroad Commission.

Mr. Culton: Some portions of that casing head gas are produced from oil wells, are they not?

The Witness: Yes, but I do not believe there will be any great amount at that time.

The number of wells located in the Panhandle Field as of July, 1940, was 1,654 wells.

By Mr. Littman:

Q. It is your testimony at this time, by way of rough calculation, that you would have to have an additional 3,000 wells drilled in the Panhandle Field in order to produce the volumes of gas which you show in your Exhibit E34 for the year 1956?

A. Yes, and the working pressures that would be required to produce that would be considerably below the observed well head pressure.

Q. Do you know how much additional horsepower will be required to produce the amounts of gas which you show in 1956?

A. No, I do not know offhand. I could probably calculate it if you wanted to go into it in that detail, but after we made all of our calculations and got all through, we would still be basing it on an estimate, and the accuracy [fol. 5277] of the result would be no closer than the accuracy of my estimation.

Q. These questions I am asking you relate to ascertaining the economic feasibility of doing what you estimate will be done. Is that correct?

A. Yes, I would say that they do relate to it.

Q. And yet, you did not, up to this time, make any estimate of these matters which we are discussing, to-wit, the number of additional wells that would be drilled and the cost of those wells, and the amount of additional horsepower which will be required, and the cost of that additional horsepower?

You did not make any investigation of that, did you?

A. Not detailed. I made an estimate of it just from observation of the field, knowing in the background at all times, that if it was possible for Panhandle Eastern to

produce greater quantities of gas than those shown in Exhibit 131, that it would not wait until such time as the pressure had gotten down to 50 pounds to produce it, that the total takes by Panhandle Eastern will be taken at a time when they can be taken for the least amount of operating expense.

Q. But, Mr. Hinton, my question related to the estimated takes by producers other than Panhandle Eastern.

A. That is right.

Q. Now, what is your answer to my question? You made no investigation—

[fol. 5278] A. (Interposing) No detailed investigation, no. It is just a knowledge of the situation as it exists and what it will probably be.

Q. And you did not make any investigation either of the amount of gathering lines and well lines and looping of lines that would be required to extract from the Panhandle Field in 1956, the total amount of gas which you show in 1934. Is that correct?

A. That is correct. You cannot, in a five-weeks' period, make that study in conjunction with other material that had to be prepared.

There would have been little time to have devoted to a detailed study of that nature.

Q. As a matter of fact, if you wanted to be anywhere near accurate about it, you would have to make the same kind of detailed study for all of the other companies and for each of the remaining years, that you made for Panhandle Eastern for the 5½ year period beginning June 30, 1941, as shown in Exhibit 42?

A. That is right, but the total result, whether they quit one or two years earlier than I have estimated that they will stop taking gas, does not influence our problem a great deal because, by that time, we will have withdrawn greater amounts from that acreage and, at that time, we would have to apply the time element to the four dimensions [fol. 5279] which we have previously spoken of, that is, length, width, depth and pressure.

We would have to apply the time element for the flow of gas to get into the well head and that would govern the amounts of gas which we would be able to take.

It is my idea that when the load becomes as low as shown here—

Q. (Interposing) As shown here, will you refer, please, to what you have before you?

A. For the year 1956, shown in Exhibit 131—that that will not be used every day. It will merely be allowed to migrate into the well bore as much as it is possible for it to do and it will be used to augment peak demands.

Q. Mr. Hinton, did you consider the peak demands of these other companies in the year 1956 and thereabouts, in making this study?

A. The peak demands of the other companies are not of the nature that our peak demand is, other than the Northern Natural Gas Company.

Q. Well, will Northern Natural Gas Company be able to supply its peaks in 1956?

A. Yes, because it maintains a reserve in the Hugoton Field.

Q. Mr. Hinton, at what abandonment pressure do you [fol. 5280] expect Panhandle Eastern's wells, on the average, to be abandoned?

A. From 300 pounds to 25 pounds.

Q. Well, I asked you for the average?

A. I would not want to make an average figure, because we do not know.

Q. At what pressure do you think most of the Panhandle wells will be abandoned?

A. I hope it will be extremely low, but the indication is, and past records lead me to believe there will be a great number of wells that will be plugged at a comparatively high pressure.

Q. What is that pressure?

A. I refer now to a list of wells which have been plugged in the Panhandle Field that was obtained from the records of the Railroad Commission for me by Jimmie Massa, and these wells have been plugged and abandoned since January 1, 1939, up to the middle of this year.

There is a total of 38 wells, and the abandonment pressures range from 304 pounds down to 7 pounds.

Q. Well, what is the average to which you referred a moment ago?

A. Just looking this over, I would say that it would probably be between 135 and 150 pounds.

Q. Average abandonment?

[fol. 5281] A. Basing it upon the list that I am looking at, and not on my idea.

Q. And yet, you say that all the other producers in the field will pass that abandonment pressure average and go on producing at 100 percent?

A. No.

Q. In the year 1956?

A. I am saying that that is what the Panhandle Eastern will encounter if they do continue to produce at that rate and it would be my judgment, with the acreage which they hold, that they are going to be able to produce a large amount of that gas that I have shown.

Q. Have you made any investigation of the operating costs that would be required to be expended to produce the amounts of gas in the year 1956 which you show in Exhibit 134?

A. No, but I did assume that the selling price of that gas would be adjusted to take care of the increased operating costs.

Q. That is a kind of a general statement. Do you know what the selling price is going to be, down in the year 1956?

A. No, but if the companies continue to make money, it will be substantially higher than it is today.

Q. Can you give us the unit cost figure of producing gas for pipe line purposes in the year 1956?

[fol. 5282] A. No, sir.

Q. You are nodding your head. Would you mind answering so the record will show?

Mr. Culton: He is shaking his head.

The Witness: I did say, so I thought the reporter understood, "no, sir."

By Mr. Litman:

Q. I am sorry, I did not hear you.

You do not know that?

A. No, and if anybody did, he does not have to worry about the future because he can set up a tent and really make a good living.

Q. But that is one of the things that it would be important to know in order to make an accurate estimate, an accurate forecast, of the production of this field. Is that right?

A. That is correct.

Q. And the effect of your having included a rate of production from this field, or a rate of withdrawal from this field, for all producers other than Panhandle Eastern, at 100 percent full-blast right straight down through the years and through the year 1956, has the effect of shortening the life of the Panhandle Field, according to your estimate, and giving you the remaining 15-year life of Panhandle Eastern, in the Panhandle field does it not? [fol. 5283] A. It would not greatly affect the 15-year period or whatever it is, I do not know whether it is 15 or 17, without counting on here, but what I am saying is that if the other companies discontinue their estimated rate of withdrawal as shown on Exhibit 134, that we will immediately take advantage of it and withdraw at a greater rate just as long as we can continue to take gas at pressures which will be about the same as those shown.

Q. If the takes of all companies decrease at the same rate as Panhandle Eastern's takes, the amount Panhandle Eastern Pipe Line Company would get would be increased over that shown in Schedule 5 and in Exhibit 131, and the economic length of life increased, is that right?

A. Yes, that would suit us very well, too.

Q. Now, this so-called inability of Panhandle Eastern to produce any more than 11 percent of its peak-year production down in 1956 is not because of any inferiority on the part of Panhandle Eastern's acreage, is it?

A. No, it is due to two things: One is that we will have been taking, we hope, at a greater than the average rate of withdrawal for the entire field; and the other is that we will not be forced to operate under those conditions.

We can move up where we will be able to produce gas for less money.

Q. As a matter of fact, you agree with the testimony of [fol. 5284] other company witnesses, do you not, that Panhandle Eastern's acreage is located in the better portions of the Panhandle Field?

A. I agree with whom?

Q. With Mr. Smith, I believe he testified to that.

A. I thought you said other companies—

Q. (Interposing) Other company witnesses. I meant other witnesses of Panhandle Eastern.

A. Yes, I think our acreage is better than the average of the field.

Q. And the open flow of Panhandle Eastern's well, on the average, is considerably higher than the wells of other companies operating in the field, is that right?

A. Yes. I do not go a great deal on open flow, because there have been a number of our wells acidized which have not been acidized by the other companies, but the ability of our wells to produce gas, I think, is better than the average.

Q. You testified that the Panhandle Field would not be "like a one-horse shay." That is to say, it would not meet with sudden death, is that right?

A. That is right.

Q. Now, that is only, however, as far as Panhandle Eastern Pipe Line Company is concerned, is that right, Mr. Hinton?

[fol. 5285] A. No, I do not believe you could say that is right. I believe I have testified that I think there is going to be a number of companies continue to take gas for years after the major pipe line companies cease to take gas from that field.

Q. Let me read you something you wrote in Exhibit 42, and ask you whether you still are of the same opinion.

A. What page?

Q. Starting at the bottom of Page 6 of Exhibit 42:

"Looking forward to the time when it will not be economical to supply a very large percentage of its market requirements from its reserves in the Panhandle Field, the Company must be pursuing a policy of developing its reserves in the Hugoton Field so that adequate production will be at all times available to supply the market. The Panhandle Field will not be a 'one-horse shay'. It will not suddenly cease producing but, in my opinion, its decline in productivity will be at an ever-increasing rate."

Is that a correct statement?

A. That is a correct statement.

Q. Well, you have not indicated in your Exhibit 134 a "decline in productivity at an ever-increasing rate" with respect to any of the other companies that are operating in the Panhandle Field beside Panhandle Eastern?

A. Yes, I have.

Q. Where?

[fol. 5286] A. Because if it were not for the fact that they are carrying on intensive drilling campaigns at this time and will continue to do so, I would have dropped off their deliverability much sharper than I did, just about the same as I would a company like our own which is practically fully developed at the present time.

Q. Mr. Hinton, you did not drop anybody's deliverability anywhere in Exhibit 134, did you?

A. That is what I was saying.

Q. Did you or did you not?

A. I dropped off Panhandle Eastern's.

Q. That is what I mean. In other words, you did not drop anybody's deliverability in the Panhandle Field through any of the years, other than Panhandle Eastern, did you?

A. That is right, but I would, if I would happen to know that they were fully developed at this time, because I would know that it would no longer be possible for them to drill additional wells.

Q. You kept everybody else going on producing in this field through the years way down to 50 pounds rock pressure, and lower, at 100 percent, substantially, of their peak year's production, did you not?

A. Yes, and I think that can happen.

Q. But you do not think it is within the realm of reasonable probability that anything like that will happen, do [fol. 5287] you, Mr. Hinton, really?

A. I believe it will be pretty close, and I can tell you why, if you want me to.

[fol. 5295] Q. Mr. Hinton, do you recognize, and are you familiar with, the figures shown in Exhibit No. 138 for identification?

A. I recognize, and I am familiar with, the source. As to the accuracy of the figures, I have not checked them.

Q. You can say, subject to check, that these figures have their origin in the Annual Reports of the Texas Railroad Commission for the Panhandle Oil and Gas Field, is that correct?

A. Yes.

Q. Now, you will observe that in the first two columns on the left side of this exhibit, No. 138, we have five periods.

Now, do you recognize these periods as embracing certain of the periods included in your table on Page 10 of Exhibit 42?

A. I do.

Q. And am I correct in stating that Exhibit No. 138 shows the periods beginning August 1, 1938, and ending August 1, 1940?

[fol. 5296] A. Yes.

Q. In other words, this table does not show the first period that you show in Exhibit 42 on Page 10, does it?

A. That is right.

Q. That is the period you did not use in your study?

A. Yes.

Q. Now, you will observe that we have taken your two-year period which is shown in the last line of the table on Page 10 of your Exhibit 42, and we show that 24-month period in two separate yearly figures, do we not?

A. Yes, you include the pressure data which was obtained midyear, 1939, which I neglected to use, due to the explanation which was read from the record of the Railroad Commission Report.

Q. In yesterday's session, you read from the Texas Commission's 1940 Report the explanation of the reasons why you did not use the 1939 pressure data?

A. As requested to do so by you.

Q. Well, does that statement which you read into the record fully describe the condition, and give the reasons for, your failure to use the 1939 pressure data?

A. Yes, but without that, I would have been inclined to have discarded it after the 1940 data was available, due to the fact that it was so far out of line from the field trend.

Q. Do you mean you would not have used the 1939 data [fol. 5297] even if you had not known of the details which you read from the Commission's Report yesterday?

A. I would have shown it, but I would have questioned it just the same as I do question it.

Q. Have you ever made any calculations to ascertain whether the effect of the situation which you read from the Commission's Report would produce any such result as that shown in here for the pressure decline in pounds for the total field for the last period?

Now, that is the figure shown on the extreme right-hand side, on the bottom line.

Mr. Culton: Before you go any further, I wonder if you really appreciate the fact that you do not show any of the so-called "casing head gas" at all on here, which enters into the pressure decline just as much as the other, particularly in view of the fact that the Railroad Commission in its Reports has referred to the fact that in 1934 and 1935 particularly tremendous volumes of gas were popped into the air as so-called casing head gas?

Mr. Littman: The Texas Railroad Commission does not include casing head gas, does it?

The Witness: No—

Mr. Culton: (Interposing) It does in computing the pressure decline. In your Report, you will notice in 1939 and 1940 they give you the amount of casing head-gas produced after they started measuring it.

Mr. Littman: The witness says what to that?

The Witness: I do not believe that is correct, because the casing head gas that they refer to is the processed casing head gas.

Mr. Culton: I say that that is measured.

The Witness: Yes, and I know no Commission that functions that gives consideration in their reports to any other than metered gas.

Mr. Culton: That is what I was getting at. There is metered casing head gas, because this says, "dry gas production."

By Mr. Littman:

Q. Do you know, Mr. Hinton, whether what Mr. Culton says is a fact?

Mr. Culton: Let's get the records. We do not want to be starting here on something that has an erroneous idea.

I think, if you will get the 1939 and 1940 Reports, you will see, as to each of those fields, they say how much casing head gas was produced.

[fol. 5299] By Mr. Littman:

Q. And the pressure decline pounds, subject to check, for each of the three fields shown, to-wit, each field, west sweet field and west sour field, and total field, are the figures which were used by the Texas Commission, are [fol. 5300] they not?

A. Subject to check, I think they are.

Q. Now, am I correct in understanding that the figures shown in the column headed, "Pressure Decline Pounds" in each of the four columns thus headed, are the figures for each of the fields and for each of the years which you used in your table shown on Page 10 of Exhibit 42, is that correct?

A. No, I used the pressure decline figures for the total field and did not apply the east or the west sweet or the west sour pressure averages.

Q. Well, am I correct in stating that the pressure decline figures shown at the extreme right-hand column of Exhibit 138 are the same ones that you used in your table on Page 10 of Exhibit 42?

A. If they are found to be in agreement with the Railroad Commission Report, when checked, they are.

Q. Well, you can see for yourself, can you not, from Page 10 of Exhibit 42, that they are the same figures, except that we show, in Exhibit 138, a separation of the final two-year period in the two one-year periods?

A. They agree in all cases except for the two-year period, during which period your figures show a total pressure drop of 19.33 pounds, while those on Page 10 of Exhibit 42 show 19.35.

Q. Well, with that exception, they are the same as [fol. 5301] those which you used in Exhibit 42, Page 10?

A. Yes, that is correct.

Q. Now, we have shown in this table, with respect to pressure decline pounds, the build-up of those total figures

as between the east field, the west sweet field and the west sour field, have we not? A. That is right.

Q. Now, with respect to the production, the total production shown for each of the three fields does not equal the total of your production from the entire field, is that correct? A. No, it does not.

Q. And the reason is simply because, as Mr. Culton has indicated, you added certain estimated figures to those of the Railroad Commission, is that correct?

A. That is correct.

[fol. 5305]

C. H. HINTON, a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Cross-Examination (Continued)

By Mr. Littman:

Q. Mr. Hinton, have you had an opportunity to check Exhibit No. 138 for identification with the annual reports of the Railroad Commission of Texas? A. I have.

Q. Are the pressure decline figures shown in this exhibit for each of the three fields, to-wit, east field, west sweet field, west sour field, and for the total field, correctly recorded on Exhibit No. 138?

A. I believe they are substantially correct, yes.

Q. And am I correct in stating that the pressure decline figures over on the extreme right-hand column of Exhibit No. 138 for the total field are the result of the weighting of the pressure decline figures separately shown on this exhibit for the three fields?

A. Well, I did not calculate those across by percents. Just checking the amounts shown in the Railroad Commission reports, I find them to be correct for the total field. [fol. 5306]

Q. Now, am I correct in stating that this exhibit shows the production of dry gas for each of the periods shown and in the amount shown as recorded by the Texas Railroad Commission?

A. The amounts shown for dry gas only are substantially correct.

Q. In other words, this Exhibit No. 13 does, in your opinion, and from your check, represent that which it purports to represent?

A. Yes, I would say that it does. It shows the weighted average pressures and the total dry gas withdrawal.

Mr. Culton: Is the dry gas what causes the reduction in pressure altogether?

The Witness: No.

By Mr. Littman:

Q. Mr. Hinton, will you please refer to your Exhibit No. 43. Your Schedule No. 3 in that exhibit contains your estimate of operation and maintenance costs west of Liberal for the Panhandle Field under the basic load and for the Hugoton Field under the basic load, does it not?

A. That is correct.

Q. And Schedule 4 of that exhibit shows your estimate of operation and maintenance costs west of Liberal in the Panhandle Field, predicated upon the estimated future load, which load was estimated by Mr. Morton and also contains similar figures for the Hugoton Field, does it not? [fol. 5307]

A. That is correct.

Q. What is the source of the figures shown in Schedules 3 and 4?

A. The accounting records for the year 1940; accounting records for the first six months of 1941, with an estimate for the last six months of 1941; and from '42 through the year '46, they are estimated operating and maintenance costs.

Q. Were the estimated amounts determined by you?

A. Yes, in conjunction with the various superintendents employed in the different departments shown here and the addition of man hours was determined by using that method; that is, I spend during the year a good deal of my time in the field and several days a year, I will take days and ride with the operating men in each of these departments and I am, I believe, quite familiar with what is going on in the field but not depending entirely upon my own judgment without going to the men who are operators of these various departments to establish the amounts used.

Q. Do these figures show all of the costs incurred by Panhandle Eastern in connection with the production and transmission of these amounts of gas, as far as Liberal compressor station? A. No, they do not.

Q. What costs do they not include?

[fol. 5308] A. Executives' salaries and Kansas City office expense, which might be properly allocated to this portion of the system.

Q. Well, it does not include anything for depreciation, does it? A. No.

Q. In other words, you exclude depreciation from these tables and you also exclude another form of depreciation which is commonly called depletion, do you not?

A. Yes, that is right.

Q. And am I correct in understanding that you do not include in these figures the expense of gas purchased from vendors? A. That is correct.

Q. So that is also excluded?

Mr. Culton: But you do include royalties?

The Witness: Yes, royalties are included, but the gas purchase expense is not included.

By Mr. Littman:

Q. And, of course, you do not show anything in these exhibits reflecting the return on investment, do you?

A. No, sir. There is one purchase cost that is included, and that is the cost of measuring the gas which is purchased. That is the only one.

Q. That is, the expense of measuring the purchase gas [fol. 5309] is included in the figures in Schedules 3 and 4?

A. Yes, sir, but the purchase price is not included.

Q. Now, have I named all of the exclusions? In other words, what I am undertaking here to do, Mr. Hinton, is to make certain that I know precisely what you have included in your Schedules 3 and 4.

If I have omitted anything, I wish you would tell us about it.

A. Perhaps it would be better to enumerate what is included, and then we would have a double check on any possible omissions.

Q. Very well.

A. The information included on Schedules 3 and 4 of Exhibit 43 includes the expense required to maintain and operate the necessary activities of the portion of the system south and west of Liberal compressor station.

Q. What is the purpose of these schedules?

A. The purpose of them is to give us an idea of what it is going to cost to operate through these years.

Q. In total? A. In total, for this portion.

Q. That is, for the periods shown in Exhibit 43?

A. Yes, that is right.

Q. To be more exact, for the periods shown in Schedule 3 and 4 of Exhibit 43? A. That is right.

[fol. 5310] Mr. Hinton, I refer you to Exhibit No. 57, which was presented in this proceeding by Panhandle Eastern Pipe Line Company witness, Mr. Watkins.

Do you have a copy of that exhibit?

A. No, sir, I have never seen it.

Trial Examiner: You may use mine.

The Witness: Thank you.

(A document was handed the witness.)

By Mr. Littman:

Q. This exhibit is entitled, "Panhandle Eastern Pipe Line Company and Subsidiary Companies—Statement of Gas Purchased Period from April 1, 1932 to June 30, 1941".

I note that in Column C is shown the average cost per M.c.f. of gas purchased by Panhandle Eastern in the Amarillo Field, is that right? A. Yes, sir.

Q. Do these figures look right to you?

A. Yes, I would say that from 1937 on, I am quite positive that they are within one-tenth of one cent of being correct per M.c.f.

Going back beyond that, I would have to do a little checking, because I cannot remember much further than that.

Q. Well, we are not interested at this time in going back that early, but I would like to call your attention to [fol. 5311] the figure in Column C showing the average cost in the Amarillo Field for the year 1941, that is, the first six months of 1941, and which is shown in Line 14 to be 3.47 cents per M.c.f. A. Yes.

Q. Is that the amount which you understand to be the average cost per M.c.f. of gas purchased in the Amarillo Field by Panhandle Eastern?

A. Yes, it might be a little closer to 3.48, just offhand, but I know it is one or the other.

Q. Now, is that the amount which you expect Panhandle Eastern Pipe Line Company to pay for its gas which it expects to purchase from its vendors in the Panhandle Field, throughout the periods shown in your Schedules 3 and 4, to-wit, 1941 through 1946? A. I am sorry—

Trial Examiner: Read the question.

(Whereupon, the pending question was read by the reporter.)

The Witness: Yes, I believe that will be correct.

However, our gas purchase contract with the Shamrock Oil and Gas Company provides that we will pay them any amount for royalty that is in excess of four cents per M.c.f. providing the weighted average purchase price of the field is increased above the average of $4\frac{1}{2}$ cents, but I believe that that does not take effect the next time until 1946. It will be in the year 1947.

[fol. 5312] By Mr. Littman:

Q. Well, inasmuch as the Shamrock contract won't be affected by the provision to which you have referred until it is effective in 1947, the answer to my original question would be that the amount which Panhandle Eastern expects to pay for its gas purchased in the Panhandle Field from 1942 through 1946, both inclusive, is the 3.47 cent figure per M.c.f. to which we have referred a moment ago?

A. I believe that is correct.

Q. Now, in Column F of Exhibit 57 is shown the average cost per M.c.f. of gas purchased by Panhandle Eastern in the Hugoton Field for the years 1932 through the first half of 1941, is that correct?

A. They look to be approximately correct to me. I would have to have those files that I handed to Mr. Goodman the other day to be able to check these last few years.

Q. Well, they look substantially correct, do they not?

A. Yes, they do.

Q. Now, I see that Line 14 of Column F shows Panhandle Eastern has paid an average of 4.26 cents per M.c.f. for gas purchased in the Hugoton Field during the first six months of 1941; is that correct?

A. That is substantially correct.

[fol. 5313] Q. And is that the amount which you expect Panhandle Eastern to pay for gas expected to be purchased

ed in the Hugoton Field from June 30, 1941, through the year 1946?

A. I assume that that will be approximately the price, although the trend of this proration problem which we have on hand might have some effect on that price.

Q. There might be some variation. In your opinion, based on your judgment at this time, you would expect the price to remain the same throughout the period which I just mentioned?

A. Yes, substantially the same.

Q. Mr. Hinton, how many operating men were employed in 1939 in connection with the part of the system west of Liberal station?

A. Do you mean regular employees, or both regular and casual employees?

Q. Well, suppose you give us both.

A. I am not sure I can give you the casual.

Q. The regular employee is more important for purposes of our discussion, but if you have the casual-employee list, I will appreciate it.

A. I do not think I do, and I am not sure I have the regular, because I took that from the records and I do not think I put it down in all cases.

I took the number of men as a base and estimated the [fol. 5314] number required in addition to what we were using, and I am not sure that I have that, but that can readily be furnished because it is available on the accounting records.

Q. I might state that, while you are looking through your work papers, I would also like to have the same information for the year 1940 and for the year 1941.

A. I am going to have to get that from the records at the office. As I thought, as I went through these various operations and talked to the different superintendents, we talked in terms of the number that would be required to be added, and I did not put down the number in each case that we were using at that time, just thinking that we had our base figure and we would probably not need to refer back to that, and we added man-hours to the base rather than detailing the base as to the number of men employed at that time, but that information can be readily gotten from our records.

Q. Well, perhaps it won't be necessary to get it if you do not have it available at the moment. Will you state what was the base year that you used for the purposes of this study?

A. 1941, the first six months, and that weighed back against the year 1940.

Q. How many additional men do you propose to hire in each of the years subsequent to your base period?

A. In the Transmission Department, which takes care [fol. 5315] of the pipe line, in the year 1942, we will add three men; in the year 1944, we will add two men.

In the measurement and gas purchase operations, in the year—

Q. (Interposing) Just a minute. You just gave us 1942 and 1944. How about the other years?

A. We do not anticipate adding men in those years.

Q. In other words, where you are silent with respect to any particular year, you mean that you are not going to add any additional men?

A. That is correct.

Mr. Culton: That is, over the preceding year, no additional men over the preceding year?

The Witness: That is right.

By Mr. Littman:

Q. Let me ask you one thing further, to make certain we understand your testimony as you go along.

You just stated you are going to add two men in 1944 and three men in 1942. Does that make five additional men in all, that is, additional over the base period?

A. That is correct.

Q. Very well.

Now, you were going to tell us about the maintenance department.

A. No, the measurement department.

[fol. 5316] Q. I am sorry, the measurement department.

A. In the year 1942, it will be necessary to use an additional meter man who will work part-time in the Oklahoma Field and part-time in the Kansas Field.

Mr. Culton: Pardon me, are you talking now just about the Texas end or the entire field? I was not certain whether I got his question.

Mr. Littman: Well, I think we ought to know that from this witness, and I also think we ought to know whether he is giving us the figures under the basic load or under the future load.

Mr. Culton: I was just trying to clarify the thing, so we will know exactly what inquiry you are making.

The Witness: I am taking them in the same sequence as you started out, that being the basic load.

By Mr. Littman:

Q. You are giving us the additional men that will be hired under the basic load for which field?

A. For the Hugoton Field is what I am starting on. I believe that is the first schedule that shows, is it not?

Q. The first schedule is the Panhandle Field.

A. I am sorry.

Q. Suppose we do this, suppose we take these matters up in this way:

Start with the Panhandle Field basic load, which is the [fol. 5317] first part of Schedule 3.

A. All right.

We are now going into the basic load for the Panhandle Field. The number of men that will be required over and beyond those working during the first six months of 1941 will be, for the year 1942 in the transmission department, two men, and that is all we expect to increase the transmission operating force in that field under the basic load through the year 1946.

The year 19—

Q. (Interposing) Suppose you give us the department first.

A. All right. The measurement and gas purchase operations for the Panhandle Field will show that an additional man will be added during the year 1943, and that is all that will be required in the measurement department through 1946.

In the compressor station operations—

Mr. Culton: (Interposing) This covers Hansford and Sneed only?

The Witness: This covers Sneed station, and it will take another operating crew of three men, which will be required as soon as the additional units are installed which are estimated to be installed during the year 1942, and that will be the only addition through the year 1946.

By Mr. Littman:

[fol. 5318] Q. May I ask you this question: When did you commence including the salary of these three men in your Schedule 3 for the Panhandle Field basic load?

A. I am in error on that, I believe—basic load—that should be 1945, instead of 1942, under the basic load.

I was thinking in terms of the future estimated load, and that will be reflected in the increase between 1944 and 1945, during which year the labor increases from \$28,207 in 1944 to \$35,707 in 1945.

Q. Just a minute, are you now speaking of the basic load in the Panhandle Field?

A. Yes, sir.

By Mr. Littman:

Q. I cannot find those figures in Schedule 3, Page 1.

A. No, they are not in there. That is a total of all operating costs.

Mr. Culton: The figures are in the working papers, though?

The Witness: Yes, they are.

Mr. Wheat: And they are in the exhibit, are they not?

[fol. 5319] The Witness: Yes.

Mr. Wheat: But not separately stated?

The Witness: Yes. This is a total, shown in the exhibit, but I am reading from the detailed figures.

By Mr. Littman:

Q: The increase is reflected in the total figure shown in your exhibit?

A: Yes, that is correct.

Q: As of what day in 1945 do you commence to include the salaries of these three additional men in the compressor department?

A: When one is making an estimate of this sort, he does not think in terms of any certain day. He thinks in terms of a year.

Q: Well, Mr. Hinton, I assume that you have salaries in here for various periods, and I merely ask you what periods are shown in this schedule?

A: That will be for the calendar year 1945, because we do not know exactly upon what day the addition will be completed, but the amounts reflected in here which are, of course, estimated, are based on starting for the calendar year 1945.

Q: I see.

A: The reason I answered it that way, I did not want to tie myself down to any day, although the figure is shown [fol. 5320] here for the calendar year.

Q: I want to know what your figures in Schedule 3 show, and you have answered that by saying that the salaries for these additional men are included as of the first of the year in which you mention they are to be employed. Is that right?

A: Yes, if that is satisfactory with you, the way I have answered it. I just wanted to be sure that I was not committing myself to say that I make an estimate five years hence and base it upon any certain day.

Q: Your figures reflect just that, though, don't they?

A: Yes, but I thought it might be a good time to explain that I could be wrong a little bit about what they do reflect.

Q: Well, I wanted to make certain I understood what your figures reflected.

Now, for instance, the transmission department, in which you stated a moment ago that three additional men were to be hired in the year 1942—you have included the sal-

aries of those three men for the entire calendar year 1942, have you not?

A. That is right.

Q. And the same is true of all of the figures which you are about to give me?

A. Yes, they are.

[fol. 5321] Q. Unless you state otherwise?

A. They are so shown, but estimated.

Q. You are not at all certain, however, that the additional compressor station equipment will be installed in the first of the year 1945, are you?

A. No, it may be installed by the middle of 1944, and it may be the middle of 1945; but, over the entire 5½ year period, the answer will be pretty close to the same, I believe, because some will be ahead and some will be late.

Q. Well, have you included the additional compressor station equipment in your itemization of capital additions required for the basic load in Exhibit 42, Mr. Hinton?

A. I should have.

Q. Where does it appear and under what year?

A. It appears at the top of Page 25 under Item D, "Install Two Additional 1300 Horsepower Units at Sneed Station with Additional Scrubber, Cooling Tower and Auxiliary Engine."

Q. And under what year have you listed that?

A. 1945.

Q. Now, will you proceed, Mr. Hinton, with the number of additional men that will be hired in each department in the Panhandle Field under the basic load?

A. In the Hansford Station, we are now operating six units and it is contemplated that two additional units will [fol. 5322] be installed during the year that the two additional units will be installed at Sneed, I believe.

I get those two, the estimated and the future, confused—no, we do not. We show no labor increase at all for the Hansford compressor station.

Q. Now, that completes the additional men for the compressor stations?

A. Yes.

Q. Under the Panhandle Field basic load and the total increase is, three men will be hired in 1945?

A. That is right.

Q. Very well. What is the next one?

A. The production department. Now, in the production department, we show that we will need extra casual labor, but do not expect to add but one additional man in the field.

Mr. Culton: That is, regular employee?

The Witness: Regular employee, and he will be added during the year 1944. There will be considerable of the casual labor which will be used during the years 1942, '43 and '44, which will be capitalized because it will be in conjunction with the drilling of new wells.

By Mr. Littman:

Q. Well, then, you have not included the casual employees in this study?

A. There is some reflection in the increased cost there [fol. 5323] that you will note under operations labor and under maintenance labor. You will notice that we do have an increase, but that we only anticipate the addition of one regular employee.

Q. I do not know that I am clear on what you are attempting to convey. Tell me whether your figures for the production department reflect anything more by way of labor than the salary of the one man that you mentioned to be added in 1944?

A. Yes, they do. There is some slight increase. It is very slight.

Q. How much does it amount to?

A. I do not recall day by day, because it is prorated between the different operations labor and maintenance labor here, but it does not amount to a great deal because these men will probably only be used for two or three months out of the year.

Q. Now, you are referring to casual labor?

A. Yes.

Q. Is that the labor which cost is expected to be capitalized?

A. Nothing will be capitalized that is reflected on this sheet of the casual roundabouts.

Q. Well, you just stated the amount of casual labor increase would be slight.

[fol. 5324] A. That is right.

Q. I would like to have a general idea of the amount in dollars, because your definition of "slight" may not be the same as mine or someone else's.

A. Well, by "slight", I mean somewhere between \$500 and \$1,000, and that is not slight to me.

Q. Well, then, it is not slight?

A. But to the company, I feel that it would be.

Q. Now, do you mean \$500 to \$1,000 a year?

A. Yes.

Q. On and after what year?

A. That will be reflected through all of the years. I mean, you go out and you hire a man to work for a month or two months, and it is reflected in these figures here (indicating). Do you understand what I mean?

Q. Can't you tell me how many dollars is reflected in the figures shown in Schedule 3, Page 1, for casual labor, so we won't have to guess about it?

A. I can, by going back to a stack of detailed sheets which were worked on about that thing (indicating), and getting it out, but it didn't amount to enough that I felt it was necessary to bring those here.

The basis for these figures—

Mr. Culton: (Interposing) Your pointing indicated about six or eight inches when you said that the sheets [fol. 5325] were "that" thick.

The Witness: I do not believe they are over 2½ or three inches, but they are 14-column paper. There was a tremendous amount of work to get those figures, and I did not include all of them in my working papers.

I just tried to explain that we would have some slight additional expense. The total increase that we have estimated for this period is very, very little.

By Mr. Littman:

Q. That is for the production department?

A. Yes, for the production department.

Q. The \$500 to \$1,000 per year which you just mentioned for casual labor represents an increase in each year over the basic year, is that right?

A. Yes, and not over the previous year.

Q. And that will start in what year?

A. That will start, in all probability, next year, and again the conditions have changed somewhat since we made up this estimate because we have been revamping our well heads under our maintenance accounts; and we have redesigned our well heads, and if it is possible to get material, we will need more casual labor than if it is not possible and, therefore, the casual labor will be governed somewhat by the material situation.

Q. Well, does that complete the production department [fol. 5326] ment additional labor?

A. Yes, that does complete the production department.

Q. Will you please continue?

A. The next department is the land and lease department. It is carried on our books as the land department, and the amounts for labor remain the same through the year 1946.

Our royalties show an increase—

Q. (Interposing) Let's just confine ourselves to the lands for the present, Mr. Hinton.

A. All right.

Q. I think it will be less confusing when we read the record.

A. That is all on the labor for the land department which will be used in the Panhandle Field.

Q. Under the basic load?

A. Under the basic load.

The dehydration plant located at the Sneed station shows no substantial increase for the period ending with 1946.

Q. Just a few dollars?

A. Just a few dollars.

Q. And, of course, that does not contemplate the hiring of additional labor?

A. That is correct.

Q. Now, does that complete the additional labor requirements under the basic load?

[fol. 5327] A. For the Panhandle Field?

Q. For the Panhandle Field.

A. Yes, it does.

Q. Now, will you give us the comparable figures for the Hugoton Field under the basic load which are reflected in Page 3 of Schedule 3 of your Exhibit No. 43?

The Witness: The estimated increase in the operating personnel for the transmission department, Hugoton Field, under the present load, would show that we will need three additional men in 1942 and two additional men in 1944.

Mr. Littman: Will you please read that answer?

(Whereupon, the last answer was read by the reporter.)

The Witness: For the measurement and gas purchase operations for the year 1942, we will add one man in the Hugoton Field, Oklahoma, and that will be all, in the main- [fol. 5328] tenance department, for the years to 1946, I believe.

For the production department in the Hugoton Field—

By Mr. Littman:

Q. Just a minute. Would you mind giving us the compressor department, which appears to be next on your list?

A. There being none in the Hugoton Field under the basic load, it will not have any.

Q. Yes, you have blanks going all the way across, haven't you?

A. That is right.

Q. Now, the next, you say, is the production department?

A. Yes, that is right, and other than casual labor, we do not expect to add more men for the operation.

However, we have cut that pretty thin because, under the basic load, we are attempting to use a combination meter man, that is, a meter engineer, and use that man for a chart changer, in order to operate that as cheaply as possible.

Q. How much of an increase do you expect in casual labor over the base year?

A. There will be some increase in casual labor amounting to approximately \$250 a year.

Q. All right. What about the land and lease department?

[fol. 5329] A. For the land and lease department, we are contemplating that there will be some required labor cost, and that is reflected by the figures shown, an increase

of from an estimated \$5,000 in 1942 to an estimated \$6,000 in 1946.

That way that will probably be carried on will be that there will be a lease man that will be sent in to this territory, part-time, whenever the regular lease employees are not able to take care of all of the necessary details.

By Mr. Littman:

Q. Am I to understand the increase over the basic load in the lease and land department is represented by the salary of a part-time employee in the years 1945 and 1946?

A. That will be in all years. In 1943, we believe that it will not be necessary, probably, to spend so much time.

The figure of \$6,000 not only reflects the amount of time that would be used, but there was some allowance made in there for a salary increase, after talking to the head of this department.

Q. Now, that completes the increased labor under the basic load for the Hugoton Field, does it not?

A. Yes, sir.

[Vol. 5330] Q. Will you state the increase for the Panhandle Field under the estimated future load, which is reflected in your Schedule 4, Pages 1 and 2?

A. The estimated labor cost, operations and maintenance, for the transmission department, will show there will be a requirement of three additional men for the year 1942, and it is believed that those three men will be all that will be necessary through the year 1946.

The estimated labor requirement increase for the measurement and gas purchase operations will show that, in 1943, there will be a combination meter man and chart changer added, which will be charged to measurement.

Q. That will be one man?

A. That will be one man, and that will be all that will be added through 1946, as we will only have an additional fifteen wells to look after.

Q. And that addition is true, under both basic and anticipated loads, is it not?

A. Yes, but there is a difference in the operations to some extent, which I do not believe that I gave much consideration to, but it would be justifiable to increase the measurement labor operations for the estimated load slightly over the basic load.

Q. Does that complete the measurement department?

A. Yes, sir, for the Panhandle Field, under the estimated load. [fol. 5331]

Q. Estimated future load?

A. All right, estimated future load.

Now, we will go to the compressor station located at Sneed and find that we add the new operating crew in the year 1942, which will be required to operate the additional 2600 horsepower added.

Q. That crew consists of how many men?

A. Three, and an auxiliary engineer.

Q. That makes four men? A. Yes.

For the compressor station at Hansford Station, the operating labor remains about the same, because it is possible for the present crew to operate the additional units.

The labor for the production department in Texas shows that one field man will be added in 1944, and that will be the only regular employee. Some casual labor is reflected.

Q. But not very much? A. Not very much.

For the land department under the future estimate load, we show a constant figure throughout the years, no increase in the labor.

The dehydration plant shows an increase of approximately \$2,000, which is accounted for by the number of—wait a minute—we are just talking about the labor, and the labor will remain constant for the dehydration [fol. 5332] plant.

That completes the Panhandle Field under the estimated future load.

Q. Now, will you give us the comparable figures for the Hugoton Field under the estimated future load?

A. Under the estimated future load, the transmission department will require one subforeman and four men in the year 1942. In the year 1943, we will add one-half man and, in 1944, one-half man; in 1945, one and one-half man and, in 1946, we add another half-man.

Q. What do you mean by "half man", a part-time man?

A. No, I mean a man who will probably start to work about the middle of the year, at the time of the year that we are trying to catch up on our painting of the meter runs and our buildings, and he will be there for the winter operation.

The next year, why, there will be another man that will be taken on during the summer time; I mean for a half-year period rather than a half man.

Q. What is the number of men for 1942?

A. There will be one subforeman.

Q. One subforeman? A. Yes.

Q. Any others? A. Four men.

Now, for the measurement and gas purchase operations [fol. 5333] in the Hugoton Field, 1942, we put on a combination meter man-chart man, and he will be on the measurement payroll altogether. Sometime during the year 1945 or '46, there will be a man put on.

The way we made this estimate was to go back and determine how many meters it was possible for one man to take care of, and then we showed that the increase in labor was governed by the number of meters, so the exact time that this will happen will be pretty well substantiated by the number of meters which will be installed upon those dates.

Q. Are you adding a man in 1945 for that purpose?

A. Well, I would say that between 1944 and 1946, we will have added a full-time man and it may be necessary that he will be another combination man.

Q. Does that complete the measurement department?

A. Yes.

Now, for the Hugoton station, commencing operations in 1946, it was necessary that we make a pretty far-fetched estimate on this; because we do not know what the conditions will be out there, but we just based it on what the

other stations were costing as nearly as we could and used common judgment and put a figure of \$10,000 down for labor. That is a very round figure.

Q. How many men does that provide for?

A. That will be one chief engineer and four men.

[fol. 5334] Q. How about the production department?

A. The production department contemplates the addition of one man in 1942; one man in 1944, and one man in 1946.

The land department will carry on operations under the future estimated load in about the same manner as they will under the basic for present load.

Q. In other words, there will be no additional labor hired under either load?

A. No, it will be just some help-out men coming in at various times.

Q. Do you know what the average salary was for the employees in the base year?

A. No, I do not, because the labor costs were taken from the records as a base. Now, if I had the number of men that we used in each of those departments, if I had that detail data here, why, it would be a simple matter to divide it into this labor cost and, tell you, but I am not able to tell you the average salary of the men at that time.

Q. Can you tell us the average salary of the men that you added in the years subsequent to your basic year, 1941? A. Yes.

Q. All right. Will you give that to us?

A. I thought I could do it by merely subtracting here. [fol. 5335] In the production department, I see that I am not able to because we have estimated, in all cases, the amount of our regular employees that will be used in the drilling of wells and that amount will be capitalized and not shown as an operating expense.

[fol. 5337] By Mr. Littman:

Q. Mr. Hinton, you show throughout Schedules 3 and 4 certain items of maintenance under the transmission department, the measurement department, the compress-

sor station department and production department, do you not? A. Yes.

Q. Now, that item of maintenance for each of the departments named includes materials as well as labor, does it not? A. That is right.

[fol. 5338] Q. Will you state how you arrived at the amounts included in your schedule for materials which are included within the meaning of the term "maintenance"?

A. Yes. We took the previous costs and after giving everything that we felt was due consideration, we adjusted those costs for each year which could be expected that would cover the same items as were included in the base figure which we used.

Q. You did not use any particular ratio—

A. (Interposing) No.

Q. (Continuing)—in arriving at the materials cost for maintenance?

A. No, sir. By talking with the field men, the superintendents, we knew that there would be certain old wooden gate valves boxes that would have to be replaced and there are innumerable items that go in to make this estimate.

Q. Now, what did you include within the meaning of the term "maintenance"? Give us a number of items which you have included as maintenance under the transmission department, for example.

A. Well, I would say that one of the maintenance costs is incurred in the maintenance of the property which shows above the ground, although that is a very small portion of the system.

Now, that is in the gathering system. We have a meter [fol. 5339] at each well. It is necessary that this meter be housed. We have the meter run to keep looking in first-class shape and they all do look just that way.

We are forced at various times to do considerable work on our meter houses, due to the fact that that is a cattle country, and they rub against the houses, and during the past two or three years, it has been necessary to build fences around a great many of these meter houses, and that has been a maintenance cost.

Then, on a gathering system, it is necessary that the pipe line system be fully equipped with drips and syphons to enable the blowing out of water and gasoline which collects in the line, and each of those drips have two gate valves and it is necessary that the crew go around and see that those gate valves are properly cleaned and lubricated before the winter operation starts.

We have found in several cases in the Hugoton Field, that it has been necessary to replace pipe between the well head and the meter run, and we have done considerable work on the grading of the ditch in which the pipe is located so that it will drain to a drip.

Now, that is all termed "maintenance labor," and that is only a small part of the items which could be named.

Q. You considered the replacement of the pipe between the well and the meter as an item of maintenance? [fol. 5340] A. Yes.

Q. What is the distance of that pipe?

A. From 50 to 70 feet, usually.

It does not all have to be replaced. It develops leaks and it is stripped and examined, inspected, and the part is replaced that appears to be faulty.

Q. Well, in determining your item of maintenance, both as to materials and labor, did you follow the Federal Power Commission's Uniform System of Accounts?

A. Precisely.

[fol. 5341] By Mr. Littman:

Q. Will you please refer to Page 1 of Schedule 3 of Exhibit 43? I note that in Line 23, which shows the expense for royalties, that the amount sharply increases from 1940 to 1941, from \$101,182 to \$132,828, respectively, and that there is a rather substantial increase in each succeeding year through 1946.

Will you explain the reasons for those increases?

A. Those royalties are in proportion to the amounts of gas which were taken during the year 1940 and 1941, and those that we estimate for the years 1942, 1943, 1944,

1945 and 1946, and the price is governed by the proportion of each priced gas that we expect to produce to make up that total amount.

The sharp increase from 1940 to 1941 reflects not only an increase in gas but a change in the royalty rate in the Panhandle Field from four cents per M. c. f. to 4½ cents.

Q: In other words, there is an increase of one-half of one cent per M. c. f. for gas produced by Panhandle Eastern in the Panhandle Field?

A: The royalty portion of that gas, yes, sir.

Q: That is from 1940 to 1941?

A: That is correct.

Q: Now, the 1941 figures reflect the increased royalty rate?

[fol. 5342] A: Yes.

Q: And that is true, in so far as the books of the company are concerned, too?

A: That is correct.

Q: And all increases from January 1, 1941, to the end of 1946 are the result, not of increases in the rate of royalty, but in increased amounts produced by Panhandle Eastern in the Panhandle Field. Is that correct?

A: That is correct.

Mr. Culton: In other words, it reflects the changes in percentage between your purchased gas and your produced gas?

The Witness: That is right.

By Mr. Littman:

Q: Another way of saying it is that the unit cost per M. c. f. of royalties does not change from January 1, 1941, through 1946?

A: I am not so sure [than] January, 1941, is the correct date for that. I don't believe that that increase in royalty became effective until sometime during the latter part of January rather than the first of January.

Q: 1941? A: 1941.

Q: While on the subject of royalties, the increase in royalties reflected for the Panhandle Field under the estimate [fol. 5343] made for the years 1941 to 1946, inclusive, is occasioned by reason of the increased amount of production in each year?

A. You are referring to Page 1 of Schedule 4?

Q. That is right.

A. Yes, that is correct.

Q. Now, what about the Hugoton Field figures that are shown in Schedules 3 and 4? Do your figures show or reflect any increased rate of royalties throughout the periods shown from 1940 to 1946, inclusive?

A. No, not on royalty. That is based entirely upon the amounts of gas which we expect to produce from our wells during those years.

Q. In other words, no increase in unit cost, in so far as royalties are concerned, throughout the periods shown for the Hugoton Field?

A. That is correct.

Trial Examiner: Mr. Hinton, may I ask whether, at some point in these exhibits, the average cost of production at the well head is shown?

The Witness: It is not shown in these exhibits.

Trial Examiner: It has not been computed at any point, and you have not covered that in your testimony, I believe?

The Witness: No, sir, I have not.

By Mr. Littman:

[fol. 5344] Q. These figures shown in Schedules 3 and 4 cover the costs which you enumerated earlier today, west and south of the Liberal compressor station?

A. That is correct. That portion of our system.

[fol. 5350] By Mr. Littman:

Q. I call your attention, Mr. Hinton, to the item of gross production tax which appears in each of your Schedules 3 and 4 and which appears for the basic load on Page 2 of Schedule 3, in Line 8.

A. Yes.

Q. Will you explain why the gross production taxes in [fol. 5351] increase under the basic load in the Panhandle Field? A. Yes, just a moment.

Mr. Culton: It is, also, due to the change in the apportionment of the purchased gas and the produced gas, isn't it?

The Witness: We have a different gross production tax in each State, and I want to be sure that I am right before I go ahead. I mean a different type of a gross production tax.

The figure for the gross production tax, shown in Line 8 of Page 2 of Schedule 3, is increased in the amounts shown, due to the fact that the gross production tax in that State is based upon 5.2 percent of the value of the gas.

As we increase the amount produced, the gross production tax is, likewise, increased.

Mr. Littman: Will you please read the last answer back?

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. Are you referring to the State of Texas?

A. Yes, that is the Panhandle Field, basic load, Page 2, Schedule 3.

Q. Well, that isn't the only reason for the increase in total for each succeeding year, is it?

A. Yes. That rule applied to the amounts which we expect to produce through those years will get us the figure that is shown under Line 8 of this Page 2, Schedule 3.

[fol. 5352] Q. Oh, well, then the increase is occasioned by reason of the increase in production from your own wells in each successive year?

A. That is correct.

Q. And the increase does not, then, represent an increase in unit cost but an increase in over-all cost by reason of your production of a greater number of units in each succeeding year shown?

A. That is correct.

Q. Now, is that same condition true of your other schedules and your other bases, to-wit, Schedules 3 and 4?

A. For the gross production tax?

Q. Yes.

A. Yes, that is true.

Mr. Culton: There is another reason for the increase on the anticipated load, though, isn't there?

The Witness: Well, I believe his question was that it did not affect the unit cost of gas.

By Mr. Littman:

Q. That was my question. In other words, under the anticipated load, if I correctly understand what you are driving at, Mr. Culton, there will be still greater amounts of gas produced and, therefore, more units and, therefore, more total dollars?

A. That is correct.

[fol. 5353] Q. Now, I note that the item of delayed rentals decreases under both heads in the Panhandle Field and increases in the Hugoton Field.

Will you please explain that situation?

A. I would like to refer to this just a moment.

Yes, I will be glad to explain that. The delayed rentals are on the decline in the Panhandle Field, due to the fact that we are drilling,—we anticipate the drilling of acreage which is now held by delayed rentals.

As soon as the well is drilled, it is no longer necessary to pay that delayed rental, therefore, the total amount is reduced.

Q. And in what year do you expect to drill your last well in the Panhandle Field? A. 1944.

Q. No drilling after 1944? A. No.

Q. Why are you still paying delayed rentals in 1945 and 1946 in the Panhandle Field, Mr. Hinton?

A. Because we have under lease some State land on which it is necessary to pay a delayed rental after it has been drilled.

Mr. Culton: It is really a lease rental, rather than a delayed rental.

The Witness: That is right.

[fol. 5354] Mr. Culton: You have to pay a certain rental in addition to royalties?

The Witness: Yes.

By Mr. Littman:

Q. And is that entire amount represented by the \$3,097 figure shown in Columns "G" and "H" of Schedule 3, Page 1?

A. It is not. That is the total cost of the lease rental which is required in addition to the drilling of the well, it is not as great as \$3,097.

Q. Well, how much is it?

A. That is 25 cents an acre.

Q. Can you give us the total?

A. There are 1,921 acres in that lease. Do you want me to explain the rest of it?

Q. Yes.

A. The rest of the amount is due to the fact that we have some scattered acreage in the Panhandle Field which is not of large enough size to drill, but which we feel is of sufficient value to continue to pay those rents, because it has good trading possibilities.

By "good trading possibilities", I mean that that acreage may be exchanged to Northern Natural or Cities Service or Hagy, Harrington and Marsh, or some company that carries leases in both fields, whereby they would exchange some acreage located in the Hugoton Field for the scattered acreage which we have in Texas which might be adjacent to a lease that they would develop.

Q. I believe you have not yet touched upon the subject of the increase in delayed rentals expense for the Hugoton Field.

A. I am sorry, I had forgotten that part of your question.

The increase in the delayed rentals in the Hugoton Field is accounted for by the fact that on the primary term of a number of a lease which covered a sizeable quantity of acreage, the rental was 25 cents per acre.

It is no longer possible, we find, to renew leases in the Hugoton Field for a delayed rental consideration of 25 cents per acre, therefore, the increase of these rentals reflects an increase from 25 cents to 50 cents an acre and, also, reflects a renewal bonus which is becoming prevalent in that field.

Mr. Culton: In other words, you expect to be able to extend expiring leases by payment of those sums?

The Witness: Yes.

By Mr. Littman:

Q. Will you explain why your delayed rental expense for the Hugoton Field is greater under the basic load than it is under the anticipated load for the years 1943 to [fol. 5356] 1946, inclusive?

A. Referring back to the capital expenditures shown under the basic load in Exhibit 42 for the years mentioned, you will find that we do not anticipate drilling the same number of wells.

The smaller number of wells which we anticipate drilling under the basic load means that we will be required to hold a larger number of acres by delayed rentals, thus holding up the amount shown under the basic load.

Mr. Culton: In other words, every time you drill a well, you stop delayed rental on 640 acres?

The Witness: That is right, unless it is State land.

By Mr. Littman:

Q. Mr. Hinton, there is an item on Page 3 of Schedule 3 in Column "E", Line 26, renewal bonus for the year 1943, in the amount of \$49,111, a very great increase over the amount for the preceding year, 1942, which was \$15,075.

Will you explain the reason for that sudden increase?

A. That is due to the fact that during the year 1933, we acquired a large amount of acreage, and this same amount of acreage expires in 1943.

Based upon the renewal bonuses that have been [being] paid in that field, that amount of expense was estimated to cover the number of acres that would have to be renewed during the year 1943.

[fol. 5357] Q. You wouldn't have such a large and sudden increase again for another ten years, would you?

A. That is right. Well, now, wait a minute. I can't say exactly because I don't remember whether through the years after 1933, we acquired any great amounts of

acreage in any of the years that might expire during any of those years after 1946.

Q. So that, if you reflected that sudden increase for the Hugoton Field for the year 1943 by reason of the renewal bonuses you would be, in a measure, distorting the unit cost for that particular year, would you not, because the amounts expended apply over the ten years, do they not?

[fol. 5359] By Mr. Littman:

Q. Do you understand my question, Mr. Hinton?

A. I believe I do, and I would say that the only way to determine whether that should be applied that year would be to find out what the cost for the next ten years is going to be, and see if that was an approximate share. I mean, that you would have to prorate it over the ten years' period.

Trial Examiner: I was going to ask whether or not that would be governed to any extent by the Commission Rules.

Do you know, Mr. Littman?

Mr. Culton: I think it would, Mr. Examiner, and my understanding is that nobody has yet determined, as far as the Commission is concerned, whether that is a capital expenditure or an operating expense.

Trial Examiner: Well, is it not, from the testimony of the witness, largely an accounting proposition?

Mr. Culton: I think it is.

By Mr. Littman:

Q. Well, you haven't ascertained what the fact would [fol. 5360] be over the next ten years, have you, Mr. Hinton?

A. No, I haven't ascertained that. You would have to find out whether the life of the field would extend beyond the next ten-year required payments and it might be necessary to prorate that cost backward as well as forward.

Q. Mr. Hinton, is it a fact that the amounts shown in Line 26 of Page 3 of Schedule 3 for renewal bonuses in each year include one year of delayed rentals?

A. No, it is not.

Q. Now, does your answer apply as to both the Hugoton and Panhandle fields?

A. That applies to the Hugoton Field only.

Q. And what is the fact as to the Panhandle Field?

A. The same thing in the Panhandle Field will run from \$5 to \$15 per acre.

Trial Examiner: I don't quite understand that answer.

Mr. Littman: I don't understand that answer.

The Witness: As I understood the question, he asked me whether that renewal bonus, as shown on Page 3, of Schedule 3, applied to the Panhandle Field as well as the Hugoton Field. Am I right?

Mr. Littman: Yes.

The Witness: And my answer was, no, that it did not, because in the Panhandle Field that same renewal bonus would run from somewhere around \$5 to \$15 per acre, [fol. 5361] excluding the extreme marginal acreage.

In other words, it requires considerably more money to renew a lease in the Panhandle Field at this time than it does in the Hugoton Field.

By Mr. Littman:

Q. What I was driving at was this: Whether or not the renewal bonus in the Panhandle Field includes one year's delayed rentals?

A. No, it does not.

Q. And if does not include one year's delayed rentals in the Hugoton Field, either?

A. No, sir, it does not.

Q. Now, the reason for the increased cost of operating the compressor stations under both the basic and anticipated load is because of the increased cost of labor and the increased cost of fuel? Is that right?

A. That is true under the—yes, that would answer the question, because your pressure decline increases your fuel cost. I think that could be answered very simply.

Q. And your figures, your dollar figures throughout Schedules 3 and 4 include the cost of fuel required to operate the compressor stations? A. They do.

Q. Well, will you look at your work papers and give us an example in one or two or three years, to show approximately how much that runs?

A. Do you mean how much it runs for a year, the fuel?

Q. Yes.

A. The cost of fuel under the present load base for the Sneed station was \$44,306 in 1940; \$54,223 in 1941. It is estimated that it will be \$67,457 in 1942; and \$72,417 for 1943; \$76,385 for 1944 and \$82,337 for 1945, and \$87,297 for 1946.

Q. Now, those amounts are included and reflected in the amounts shown in Schedule 3, Page 1, Line 14, is that correct? A. Yes, that is correct.

Q. Did you give the amount included in 1940? A. Yes.

Q. What was the amount? A. \$44,306.

Q. And that amount was taken from the company's accounting records? A. That is correct.

Q. Now, would you be so kind as to read the same comparable figure for the Hansford station, which is shown on the same page?

A. The Hansford station did not operate in 1940.

Q. Yes, I note you don't start until 1941.

A. Do you want those for the years?

[fol. 5363] Q. Yes, for each of the years, the amount of fuel cost included in your figures shown in the Schedule.

A. For the year 1941 it was \$31,560; for the years 1942 through 1946, the amount was \$25,800.

Q. And is that included and reflected in the figures shown in Line 12 of Schedule 3, Page 1?

A. Yes, you will note that that is a decline over the 1941 cost.

Q. Will you state the fuel costs that are included for the Hugoton Field, basic load, on Schedule 3?

A. None.

(Discussion off the record.)

By Mr. Littman:

Q. Will you give us the comparable figure, that is, the fuel cost that is included for the Panhandle Field under the estimated future load as between Hansford and Sneed shown in Schedule 4, Page 1?

A. You mean "as between" or "for each"?

Q. I meant, for each.

A. The fuel figure for the Speed compressor station for the year 1940 is \$44,306; for 1941 it is \$54,223; for 1942 it is \$73,850; for 1943 it is \$85,710; for 1944 it is \$92,147, and for 1945 it is \$108,460; for 1946 it is \$115,074.

Q. And the figures which you just read are reflected [fol. 5364] in, and included in, the figures shown in Line 14 of Page 1 of Schedule 4 of Exhibit 43?

A. Yes, that is correct, they are so reflected.

Q. Now, will you proceed to give us the Hansford station figures which are shown in Line 12 of that page?

A. For the year 1941, \$31,560; for 1942 it is \$49,500; for 1943 it is \$54,450; for the year 1944 it is \$55,200; for the year 1945 it is \$60,600; and for the year 1946 it is \$60,600.

Q. Now, Hansford and Sneed compressor stations used natural gas exclusively for fuel, did they not? A. Yes.

Q. And all of the fuel figures that you have given us thus far are natural gas cost, exclusively.

A. That is correct.

Q. Now, will you please give us the comparable fuel cost figures reflected in Schedule 4, Page 3 of Exhibit 43?

A. Which schedule, please?

Q. Schedule 4, Page 3, for the Hugoton Field estimated figure load.

A. I believe you will have but one figure for the year 1946.

Q. That is correct.

A. And that figure will be \$9,632.

Q. Mr. Hinton, doesn't your estimate of increased production [fol. 5365] include the quantities of gas used by Panhandle Eastern as fuel in its own operations?

A. It does.

Q. Page 15 of Exhibit 42, I believe, states that very clearly, does it not?

A. It should if it doesn't.

Q. At that point you say, "this estimate was the same as that contained in Exhibit 40, which is in connection with his testimony, and we so adjusted the gas at 16.4 pound base with an addition for the gas required for power and loss due to line leakage. The estimated requirements are as follows."

Then follows the amount of gas which includes the amount used in your own operations.

A. That is the way it should read.

Q. And that, of course, includes the amount of fuel used in the compressor stations?

A. That is correct.

Q. Inasmuch as the increased royalties, production, operation and maintenance, which you estimate and show in Schedules 3 and 4, include the cost of producing gas, the increase for fuel is a duplication, is it not?

A. No, sir.

Q. Why?

A. Not if I understood your question correctly. Would [fol. 5366] you state that question again, please?

Q. Since the increased royalties, production, operation and maintenance include all the costs of producing gas, the increase for fuel is a duplication, is it not?

A. No, sir, it is not.

Q. Well, who does Panhandle Eastern Company pay for this fuel?

A. That is, to whom do they pay these amounts that you have read into the record as the cost of fuel?

A. They deduct that. It has to be deducted from their potential amount of money that would be obtainable for that gas.

Mr. Culton: In other words, it is reflected in the sales on the other side of the ledger?

The Witness: That is right. If it were not for the fact that we had to have the fuel, the sales would be far beyond what they are.

They are influenced by the percent required for fuel.

By Mr. Littman:

Q. And to whom do they sell this gas that Mr. Culton suggested to you a minute ago?

A. They don't sell it.

Q. Well, Mr. Hinton, there certainly is a duplication in your exhibit.

Mr. Culton: We think you should examine the account [fol. 5367] countant about that. I think you will find you are under a misapprehension, yourself.

By Mr. Littman:

Q. Well, do you know of your own knowledge whether you have actually duplicated the fuel cost in your Exhibit 43?

A. I would say that it has not been duplicated, but that only proper allowance has been made for it.

Q. But you are not sure about it?

A. As far as I am concerned, it has not been duplicated. It is a justifiable allowance.

Mr. Goodman: How do you derive it, Mr. Hinton? What figures do you pull out to get this fuel cost?

The Witness: The worth of the gas to Panhandle Eastern Pipe Line Company, that is established by the Accounting Department.

Mr. Goodman: Then, it is not a cost figure, it is a valuation?

The Witness: I expect that would be a better way of saying it.

Mr. Goodman: But all cost figures for the quantities of gas produced, both sold, lost and used, have been excluded?

The Witness: Yes.

Mr. Goodman: But on top of that you add a certain valuation figure, representing additional value over and above cost for the gas which was used as fuel?

[fol. 5368] The Witness: No, we include—

Mr. Goodman: (Interposing) You say "no", but there is no question but what you have done it, on the basis of your answers, Mr. Hinton. Wouldn't you like some time to think it over?

The Witness: No, I don't need time.

By Mr. Littman:

Q. Mr. Hinton, let's get at it this way:

You include,—and this will take just a minute, if your Honor please—in your tables, Schedules 3 and 4, every dollar of expense required to produce every M. c. f. which the company is going to use as fuel to operate its compressor stations. Is that right?

A. That is right.

Q. On top of that, you have added the amounts which you have just read into the record, which the Accounting Department says it has evaluated as the cost of the gas used as fuel for compressor stations, have you not?

A. Yes.

Q. So you have duplicated by that procedure every dollar which you include in your exhibit for the cost and expense of producing the gas which will be used as fuel in your own operations, inasmuch as you have already stated that your total amounts of gas produced include the [fol. 5369] amounts to be used as fuel. Is that not right?

A. Yes, and if it was not done that way, there would be a different value of that gas at the sales end of the line.

Q. Well, how is this value of gas determined?

A. It is determined by averaging the worth of the gas into the line, that is in the line owned by the company.

Q. But all of that is added on top of all those other expenses for each and every M.c.f. that you have included in your exhibit. Is that not right?

A. In answering that question, I would say that you would have to make allowances elsewhere if it was not carried on in the manner in which it is.

Mr. Goodman: Where would you make those allowances?

The Witness: You would make it in the price of gas. In other words, this gas down in the field would have very little value if we did not use gas to compress it and get it to the market.

Mr. Goodman: All right, but you have already indicated the costs of producing the total gas which you have produced?

The Witness: That is right.

Mr. Goodman: Now, you use up some of that gas?

The Witness: That is right.

Mr. Goodman: Your cost has not increased any, you haven't spent any more money, is that right?

The Witness: Why, we certainly have, Mr. Goodman, because if we could transport the same amount of gas to [fol. 5370] the sales end of our line as we put into Liberal without any deduction for fuel, we could afford to sell our gas at a lower price.

There must be some allowance made there. Whether I am talking about it in the strict, proper accounting method or not, I do not know. I am not an accountant, but I do feel that the method in which it has been handled is justifiable.

Mr. Goodman: You mean you are just out, then, that quantity of gas which you have produced?

The Witness: That is right. We pay for it and if we did not have an allowance to get that back, why, it would show that we had taken a decided loss in dollars.

Mr. Goodman: Well now, shouldn't you, then, deduct from the value of the gas consumed what you have already paid for it?

The Witness: I don't know, Mr. Goodman, I believe that is an accounting problem and would have to be decided by the Accounting Department.

As I see it, there are several ways in which it might be handled.

By Mr. Littman:

Q. Let me ask you this: If there is an offsetting figure entry in the books to offset the amount which you used and took from the books as the actual cost of gas used in fuel, then, would you admit that you have made a duplication in Exhibit 43 for the cost of fuel?

[fol. 5372] C. H. HINTON, a witness, having been previously sworn, resumed the stand and testified further as follows:

Cross-Examination (Continued)

By Mr. Littman:

Q. Mr. Hinton, have you had an opportunity, over the noon recess, to reflect a little about these fuel costs which are included in your Schedules 3 and 4 of Exhibit 42?

A. Yes, sir, I have.

Q. And do you now say that you have duplicated in these schedules the cost of fuel used in compressor station operation?

A. I believe the answer that I first gave was correct, that whatever it is, the application of the amount of the fuel for the compressor station is reflected in the selling price of the gas.

Q. I am afraid I do not understand that answer.

A. That is, it is merely an accounting matter, and there is a credit shown which is reflected in the accounting records and the amount of the power cost is shown as a credit upon the company books.

[fol. 5273] Q. And should be credited against your Schedules 3 and 4 as well?

A. Yes, I would say that a proportionate part of it should.

Q. In other words, there is a duplication, you say now, to the extent of at least a proportionate part of it?

A. Yes.

Mr. Culton: By that you mean if you pay no attention to the receipt records on the account, there would be a duplication?

The Witness: Yes.

Mr. Culton: But by considering that circumstance, there is no duplication at all?

The Witness: The duplication will be erased as soon as the credit which will appear on the accounting records is applied to this proportionate part of it with the exception of the cost of purchased gas which is not shown in Exhibit 43.

By Mr. Littman:

Q. In other words, if I correctly understand you, the Federal Power Commission cannot use these figures shown in Schedules 3 and 4 of Exhibit 43 for purposes of com-

putting the effect of these figures upon the rates for the periods shown until and unless a credit is made against the totals for the cost of fuel used in operations?

[fol. 5374] A. I believe that that would be correct.

Q. Now, in order that we may have no misunderstanding about it, your operation and maintenance costs shown and totaled in Schedules 3 and 4 of Exhibit 43, include all of the operation and maintenance costs for every M. c. f. gas contemplated to be used and used, in fact, by Panhandle Eastern as fuel?

A. No, it does not include the purchased gas. By that I mean the gas which is purchased from other vendors than Panhandle Eastern.

Q. Would you say my question was correct if I were to confine it to the number of M. c. f.'s which are shown in Schedule 5 of Exhibit 43?

A. Yes, I believe that would be approximately correct.

Q. Well, it would be wholly correct, wouldn't it?

A. I say approximately, because those figures shown in Schedule 5 are estimated figures. If we assume that my estimate is 100 percent, then I will say that your conclusion is wholly correct.

Q. Well, your cost of operation figures shown in Schedules 3 and 4 are the estimated costs to produce the estimated amounts of M. c. f.'s shown in Schedule 5 of Exhibit 43, is that correct?

A. Yes, that is correct.

Q. Now, may we then not agree that in so far as the gas [fol. 5375] expected to be produced by Panhandle Eastern, in so far as that gas is concerned, that you have included in your Schedules 3 and 4 the cost of operation and maintenance for all of that gas which will be used as fuel, is that right?

A. Yes, speaking as of a point of location at the intake side of the compressor station, that would be correct.

Q. What compressor station?

A. Any compressor station that uses fuel.

In this case, it would be Sneed and Liberal, meaning Sneed for the Panhandle gas and Liberal for the Hugoton gas, up to the year 1946, on the estimated schedule where that portion of the gas that goes through the Hugoton system is again compressed, that is, I refer to the proposed station which will be located near Hugoton, Kansas.

At that time, we would have to apply that to the intake side of that proposed station.

Q. Well, we have all the costs of operation and maintenance included in Schedules 3 and 4 in order to produce the total number of M. c. f.'s which are shown in Schedule 5 of Exhibit 43 and which include the M. c. f.'s out of that total that will be used as fuel, is that correct?

A. I believe that is correct, but I had better check that back to be sure.

Will you repeat that question, please?

(Whereupon, the pending question was read by the reporter.)

[fol. 5376] The Witness: Yes, that is correct.

By Mr. Littman:

Q. Now, in addition to those maintenance and operation costs, you have included an additional and separate amount in each of the years for fuel and in the amounts which you read into the record late this morning?

A. That is correct.

Q. Over and above the costs to which I have just referred?

A. No. Are you referring to Schedules 3 and 4?

Q. Yes.

A. No, they are reflected in the schedule, those fuel costs are reflected in those schedules.

Q. I mean, over and above the operations and maintenance costs?

A. Yes. As I have said, that is with the exception of the gas purchased from others.

Q. Well, I am coming to that now.

Assuming that the Commission were to accept the totals for these schedules as the operation and maintenance costs west of Liberal, and assuming that the Commission were, in addition thereto, to include in determining the rates for the future the cost of gas purchased, is it not a fact that under those circumstances the entire amounts which you read this morning into the record of fuel costs which are [fol. 5377] included in Schedules 3 and 4 would have to be credited against the total which I just stated?

A. Yes, they would have to be credited by the amount of the gas purchase contracts. Also, there would have to be an allowance made for the depletion and amortization required in the system to produce the amounts of gas which would come from company wells.

Q. And the real credit would be the same rate per M. c. f. as that which you charged in these schedules for fuel?

A. The credit would have to be the same rate, yes, sir, and I believe that that is compulsory under the Federal Power Commission System of Accounting.

Q. Now, Mr. Hinton, on that particular subject, am I correct in understanding that the books of Panhandle Eastern show separately as an item of expense the cost of fuel used in the company's operations, is that right?

A. That is correct.

Q. Now, further on down the expense side of the books, there is a credit in an equal amount made, is that not correct? A. That is correct.

Q. In other words, it is put in to expense and then taken out?

A. Yes, and the reason that it is put in, it is an arbitrary figure selected for the purpose of comparing the cost of operations at the various compressor stations located along [fol. 5378] the system.

Q. In other words, if you did not make a credit and take it out later on, you would have a duplication in the expenses shown on your books to that extent, would you not? A. Yes, that is true.

Q. And, as you state, it is shown that way on the books of the company in order to merely show, as a separate item, how much it costs each year to supply fuel for operations, is that right?

A. That is as I understand it, yes, sir.

Q. Now, what you did, if I understand you correctly, was to take the fuel-cost figure for your base year, 1941, from the books of the company and include it in Schedules 3 and 4 of Exhibit 43, under the title of "Operation for the Compressor Stations?"

A. I applied the unit cost which was furnished by the Accounting Department to the M. c. f. that would be required for fuel.

Q. And you did not make any credit for deduction from that amount?

A. No, that is done in the Accounting Department.

Mr. Culton: Mr. Littman, you have been questioning quite a while about a matter on which we are fully agreed, that if expenditures are not related to receipts and are considered only from the standpoint of expenditures, then the [fol. 5379] item for cost of gas used for fuel would come out.

Mr. Littman: Would come out?

Mr. Culton: As an expense item. There is no question about that between us, but if you apply it to receipts, that is, to our book records showing we have received from our sales this sum of money for this gas, then it would have to be considered.

It would have to appear on both sides, both as a charge and as a credit.

By Mr. Littman:

Q. Now, I believe you have stated, Mr. Hinton, that the figures shown in Schedules 3 and 4 of Exhibit 43 do not include the cost of gas purchased by Panhandle Eastern from its vendors? A. That is correct.

Q. I would like to have you estimate for us the amount of the cost of gas purchased under the basic load in the Panhandle Field for the year 1941, using as the unit cost the figure of 4.47 cents.

A. For Hugoton Field, you say?

Q. I said, for Panhandle Field.

A. Well, then, that unit cost would be wrong for the Panhandle Field.

Q. What is the correct amount for the Panhandle Field?

A. 3.47 or 3.48.

[fol. 5386] Q. I thought I just mentioned that—

Mr. Culton: You said 4.47.

The Witness: For the Panhandle Field.

Mr. Littman: I mis-spoke myself. I thought I read 3.47. That is the figure I meant to say.

The Witness: I just called your attention to it because we will have to make a calculation—

By Mr. Littman:

Q. (Interposing) Using the average cost per M.c.f. of gas purchased in the Panhandle Field of 3.47 cents per M.c.f., I would like to have you give us the cost of purchasing the amounts of gas which you anticipate will be purchased under your assumption of the basic load.

Mr. Culton: Do you mean that for each of the five years or 15 years?

Mr. Littman: I asked him for the year 1941.

Mr. Culton: I did not catch that.

Mr. Littman: Yes, for the year 1941.

By Mr. Littman:

Q. Mr. Hinton, I am quite sure you will find the amount of gas purchased under the basic load in Exhibit 132, which is a copy of one of your working papers.

Mr. Culton: There is no difference that year between the basic and the anticipated, is there?

Mr. Littman: That is right.

[fol. 5381] The Witness: That is for the year 1941?

Mr. Littman: Yes, sir.

The Witness: That amount would be \$707,061.08.

Mr. Littman: For our present purposes, let us not consider the pennies.

The Witness: All right.

By Mr. Littman:

Q. Now, when that amount is added to the total of Column "C" for the year 1941 for operation and maintenance costs west of Liberal shown in Schedule 3, Page 2, Line 10, you secure the total—

A. (Interposing) Wait a minute. You say, Schedule 3, Page 2?

Q. Yes.

A. For the Panhandle Field?

Q. For the Panhandle Field basic load.

A. My Exhibit 43, Schedule 3, Page 2, is a grand total.

Q. Yes, that is what I mean.

A. I see.

Q. I want you to add to the grand total of your maintenance and operation costs west of Liberal under the basic load in the Panhandle Field, the cost of gas purchased in that year in that field, to give us the total cost of gas purchased and operation and maintenance.

A. That amount is \$1,165,515.

[fol. 5382] Q. Now, I would like to have you state the unit cost per M.c.f. produced and purchased—

Mr. Culton: (Interposing) On your computation?

Mr. Littman: (Continuing) Just a minute. In the Panhandle Field under the basic load for the year 1941, which is simply the total which you just gave, divided by the number of M.c.f.'s produced and purchased in that year.

Mr. Culton: Without making another computation, you want the gas used for power deducted before you make that computation, don't you?

Mr. Littman: Mr. Culton, I am going to suggest that we not make the credit for fuel.

Mr. Culton: All right. It would be a very small amount anyway.

Mr. Littman: It probably would, when reduced to unit cost, but we do not want to get to that fine a point for purposes of this line of inquiry.

Mr. Wheat: What was your figure of M.c.f.'s?

The Witness: 44 billion cubic feet.

By Mr. Littman:

Q. In other words, you are now referring to total M.c.f.'s shown in Exhibit No. 132 for the west Panhandle Field, aren't you?

A. Yes.

Q. Of 44 million M.c.f.?

[fol. 5383] A. I do not have Exhibit 132 right at hand but it is shown on 131, and that is what I am using.

Q. Yes; it is the same figure, but pretty soon you may have to use Exhibit No. 132.

A. You want the basic load, and that is probably on Exhibit 132. What is it?

Q. 44 million. It is the same figure under both.

A. Yes, but if you want me to continue on the basic load, I will have to have—

Mr. Culton: (Interposing) The next one is 45 million for a good many years, I think.

The Witness: Yes, but the amount purchased—now, then, I have the answer to your question.

By Mr. Littman:

Q. Very well, what is it?

A. The cost of gas per M.c.f., including maintenance and operation, as shown throughout this schedule and in addition to that, the purchase cost but without allowance for depletion and amortization is .0265 cents per M.c.f.

Q. I think your decimal point is off. You mean, \$.0265 or 2.65 cents, do you not?

A. Yes, I stand corrected.

Q. Suppose we be consistent throughout, and read these unit costs in terms of cents.

A. All right.

[fol. 5384] Q. 2.65 cents is correct?

A. Yes.

Q. Now, I would like to have you compute the unit cost of the items which you just named on the same basis for the year 1942 under the basic load.

A. Yes. The answer for 1942 shows a unit cost of 2.66 cents per M.c.f.

Q. That is the figure we have.

Now, I shall read the comparable unit costs which we calculate from your exhibit, Mr. Hanton, and we will ask you to check these figures and correct them if they are wrong, in order to save time on the record now.

A. Yes, sir.

Q. Now, for the Panhandle Field under the basic load, reflected in Schedule 3, Pages 1 and 2, the unit cost figures are as follows:

For 1941 — 2.65 cents.

For 1942 — 2.66 cents.

For 1943 — 2.64 cents.

For 1944 — 2.61 cents.

For 1945 — 2.63 cents.

For 1946 — 2.41 cents.

Now, Mr. Hinton, assuming the mathematical correctness of those figures which I have just read into the record, they show, do they not, that the unit cost of operation [fol. 5385] and maintenance and cost of gas purchased through the years 1941 through 1946 do not vary to any appreciable extent?

A. No. These do not vary to any appreciable extent, but if amortization and depletion were included on the additions which will be required to bring the gas purchased volumes down to what they are, they would show an increase.

Trial Examiner: May we have the comparable figure for 1940, without too much trouble, at this point?

Mr. Littman: I do not have the comparable figure for 1940.

Trial Examiner: Can you give us that, Mr. Hinton?

The Witness: Yes, I can.

Mr. Littman: Nor do I have it for the five-year period.

Mr. Wheat: You mean the total?

Trial Examiner: Average.

Mr. Littman: The average for the five-year period.

The Witness: During the year 1940, we purchased 16,427,962 M.c.f. and by applying the same unit price of 3.47 cents per M.c.f., we arrive at a cost of \$570,050. The cost per M.c.f. to Panhandle Eastern was 2.37 cents per M.c.f.

By Mr. Littman:

Q. For the year 1940?

A. Yes.

Mr. Culton: Those figures will all vary greatly by the amount of purchased gas and by the amount of produced gas?

[fol. 5386] The Witness: That is correct.

Mr. Culton: And these prices are all higher than the prices if you had just used the produced gas?

The Witness: Yes, because without taking into consideration amortization and depletion, our purchased gas comes to us at a higher cash out-of-pocket cost.

By Mr. Littman:

Q. Yes, and we have been using, for purposes of our calculation, of course, the ratio of purchased and produced gas which you used in your estimate as shown in Exhibit 132 for the basic load and as you will soon see, as shown in Exhibit 131, for your future load.

A. That is correct.

Q. In other words, the unit cost, the over-all unit cost of producing your own gas goes down as you produce more?

A. That is right. Unless—

Q. (Interposing) And your total cost of gas purchased also goes down as you produce more from your own wells?

A. If you will confine that to the proper period of time, I will agree. If we carry that on beyond the period considered in these schedules, it will not apply.

Q. Well, you have shown, in your schedules, the data for the years through 1946, have you not?

A. Yes.

Q. Now, Mr. Hinton, you just alluded a moment ago to [fol. 5387] the fact that my unit cost figures do not include the cost of amortization and depletion, did you not?

A. That is right.

Q. Neither do yours?

A. That is correct.

Q. Now, the unit cost of depletion is the same, is it not, throughout? Are you familiar with Mr. Biddison's exhibit showing the unit cost?

A. No, I am not, and I might not agree with Mr. Biddison's depletion costs if I did see them.

Q. At any rate, for your information, Mr. Biddison shows a uniform unit cost of depletion for the gas produced in the Panhandle Field through the future years, and likewise in a uniform cost for the gas produced in the Hugoton Field.

Now, the figures which I have read to you show, do they not, that the unit cost of these items, of which we are talking now, to-wit, operations and maintenance and gas purchase expense will, under your assumptions under the basic load, be lower in 1946 than in 1941, is that correct?

A. No, if—

Q. (Interposing). Isn't 2.41 cents lower than 2.65 cents?

A. Yes, but we are only considering part of our problem [fol. 5388] when we refer to this as a comparison.

Q. And, Mr. Hinton, we are using that part of the problem which you have presented?

A. Yes.

Mr. Culton: You mention only part of it. He presented several million dollars capital expenditures that you paid no attendance to.

Mr. Littman: We are, at this writing, discussing the effect per unit of production of these so-called increased expenses.

Mr. Culton: That is, that part of the increased expenses.

By Mr. Littman:

Q. Well, may we agree, Mr. Hinton, that these increased totals which you show in Schedules 3 and 4 throughout for the various years do not necessarily reflect increased unit costs?

A. Yes, we may agree to that.

Q. And you do not mean to infer by these Schedules 3 and 4, do you, that simply because we have a larger total amount in 1946 over that in the previous years, that your unit costs are going to be higher in that year, do you?

A. Will you read that question, please?

(Whereupon, the pending question was read by the reporter.)

The Witness: Looking at it from a straight operating [fol. 5389] and maintenance standpoint, reflecting the items shown in Schedule 3, they will undoubtedly show a decrease in cost per M.c.f., but when we take into consideration the amount of capital expenditure and the short-

enough length of life of our reserve, why, naturally, they are going to show an increase.

By Mr. Littman:

Q. Well, you mean after-1946?

A. After 1946, the operating expenditures themselves will probably do much to hold the price level or slightly higher without consideration to the capital expenditures and the amortization and the depletion of reserves.

Trial Examiner: May I ask whether all of these figures that you read, Mr. Littman, are at the intake at the Liberal compressor station, the units costs?

Mr. Littman: They are at the points where this witness considered these costs shown in Schedules 3 and 4 to be, wherever that is, and I presume that is at Liberal compressor station and south, south of Liberal.

Trial Examiner: Well, at the intake at the compressor station?

The Witness: That is correct. That is the point of delivery covered by these figures.

By Mr. Littman:

Q. Now, what we are doing by these calculations, Mr. Hinton, is simply trying to ascertain what effect the figures shown in your Schedules 3 and 4 plus the cost of purchased gas, will have upon the unit cost over all of the gas produced, is that correct?

A. Yes. I think I understand entirely what you are doing, which is just to arrive at the unit cost per year.

Q. For the sums which you have shown in Schedules 3 and 4.

A. That is right.

Q. Plus the cost of gas purchased.

Now, you did not show anywhere in your Exhibit 43 the breakdown under the basic load in the Panhandle Field as between gas produced and gas purchased, did you?

A. I cannot be sure about that. You mean, whether it shows in my working papers?

Q. No, whether it shows in your original Exhibits 42 or 43?

A. I doubt seriously if it is in there. I do not recall putting it in.

Q. I am quite sure it is not.

Now, we have those figures in the record under the basic load in Exhibit No. 132, which were furnished from your working papers at my request, is that correct?

A. Yes.

Q. And we have the figures for the anticipated load as to both the west Panhandle Field and the Hugoton Field in [fol. 5394]—Exhibit No. 131, which is a part of your working papers and which was also furnished at my request, is that right?

A. Yes, that is correct.

Q. Now, let's go to the next schedule, to-wit, Schedule 3, Page 3, which shows the maintenance and operation costs west of Liberal for the Hugoton Field under the basic load, and I shall read into the record the unit costs which we have calculated per M.c.f. for each of the years 1941 through 1946, including the cost of gas purchased in the amounts shown in Exhibit No. 132, at the price of 4.26 cents per M.c.f., which is the unit cost of gas purchased in the Hugoton Field as testified to by you in this morning's session.

I am going to read these, and I am going to ask you also to check the accuracy of my calculations.

A. That is Page 3, Schedule 3?

Q. Yes.

For 1941 — 4.32 cents.

A. Yes, it is thoroughly understood that these are subject to check.

Q. Yes. As a matter of fact, I am going to insist that you check them, because—

Mr. Culton: (Interposing) I will say these others look about like I have always understood them in the Panhandle Field.

Mr. Littman: Very well.

[fol. 5392] Mr. Culton: I am satisfied you have them about correct.

By Mr. Littman:

Q. The figures are as follows:

1941	—	4.32 cents
1942	—	4.42 cents
1943	—	4.72 cents
1944	—	4.48 cents
1945	—	4.44 cents
1946	—	4.44 cents

Now, assuming the correctness of the figures which I read, Mr. Hinton, they show an increase per unit from 1941 to 1943, and then a slight decrease for the remaining three years. Is that right?

A. They are constant for the last two years, which is a slight decrease over the previous years.

Q. Now, we have also made a total for both fields under the basic load, and we have calculated the unit cost per M.c.f. for the two fields under the basic load condition, and I shall read those into the record.

Trial Examiner: Pardon me, was not this last that you read based on Schedule 3, Page 3?

Mr. Littman: Schedule 3, Page 3, that is right, for the Hugoton Field.

Trial Examiner: That is captioned, "Basic Load, Hugoton Field?"

[fol. 5393] Mr. Littman: Yes. The figures that I propose to read into the record at this point are for both fields combined under the basic condition.

Trial Examiner: Still basic load?

Mr. Littman: Yes.

By Mr. Littman:

Q. The figures are as follows:

1941	—	3.09 cents
1942	—	3.12 cents
1943	—	3.18 cents
1944	—	3.10 cents
1945	—	3.10 cents
1946	—	2.94 cents

° For the five-year average, 1942 to 1946, inclusive, 3.09 cents.

I shall now read into the record the unit costs comparable to those which I have read heretofore for the Panhandle Field under the estimated future load which is detailed on Pages 1 and 2 of Schedule 4. This is for the Panhandle Field alone.

1941	—	2.65 cents
1942	—	2.65 cents
1943	—	2.59 cents
1944	—	2.55 cents
1945	—	2.52 cents
1946	—	2.30 cents

[fol. 5394] The comparable figures for the Hugoton Field under the estimated future load are as follows:

1941	—	4.32 cents
1942	—	3.72 cents
1943	—	4.22 cents
1944	—	3.96 cents
1945	—	4.16 cents
1946	—	2.54 cents

Now, I shall read the unit costs for the Panhandle Field and Hugoton Field combined, and this is under the estimated future load:

1941	—	3.09 cents
1942	—	2.93 cents
1943	—	3.01 cents
1944	—	2.96 cents
1945	—	2.96 cents
1946	—	2.93 cents

For the five-year average, 1942 to 1946, both inclusive, 2.96 cents.

Mr. Culton: Mr. Littman, I must have misunderstood you or the averaging works out kind of funny. I understand you to say the estimated cost in the Panhandle Field, 1946, was 2.30.

Mr. Littman: Under which basis, Mr. Culton?

Mr. Culton: Under the estimated load and, in the Hugo-
[fol. 5395] ton Field, 2.54.

Mr. Wheat: I think you must have been mistaken in the last figure.

Mr. Culton: I do not see how that could be true and have an average of 2.93.

The Witness: That unit cost which we used was 4.26, was it not?

Mr. Littman: Yes, 4.26 cents, and the amount of gas purchased in that year was 815,248 M.c.f. under the estimated future load—I am sorry, that is the total dollars.

The Witness: It is 12,897,000,000 cubic feet.

I do not get either one. I get 3.29.

By Mr. Littman:

Q. Let me ask you this, Mr. Hinton, what is the amount of dollars that you get for gas purchased in 1946 in the Hugoton Field under the estimate future load?

A. \$549,412.

Q. Well, we have \$815,248, so that would account for the difference in our figures.

A. I get the same answer that I got the first time, so instead of that being 3.54 as we suspected, it is 3.29.

[fol. 5396] Q. You get 3.29 cents per M.c.f.?

A. Instead of the—

Q. (Interposing) 2.54 per M.c.f. for the Hugoton Field under the estimated future load for the year 1946?

A. Yes.

Q. That is probably where the error lies.

A. Well, we can tell what percent each of these participates in the total market and check your figure in that manner.

By weighting those figures which we obtained by the same method of calculation which we have followed, namely, that of adding the cost of the purchased gas to the operating costs shown on these schedules, I arrive at a price of 2.65 cents per M.c.f.

Q. For what?

A. For both fields.

Q. What is that amount again?

A. 2.65 cents.

Mr. Culton: For both fields?

The Witness: Yes.

Trial Examiner: That is in place of Mr. Littman's figure of 2.93?

The Witness: Yes.

Trial Examiner: That, of course, would affect any average.

[fol. 5397] The Witness: Yes. In fact, to obtain an average, each year would have to be weighted with the amount that it participated in the total for the five years, to arrive at the proper average.

It would not be a pure arithmetical calculation.

By Mr. Littman:

Q. Well, you are going to check all of these figures, at any rate, Mr. Hinton, are you not?

A. Yes, I believe I had better.

Q. And if there are any errors in our calculations, you can then correct them tomorrow.

A. They look reasonably close to me and are taking the proper trend.

Q. And the trend is generally downward?

A. It must be, on this portion of the expense item.

[fol. 5398] Q. Mr. Hinton, in arriving at the conclusion that Panhandle Eastern is going to abandon production in the Panhandle Field in the year 1956, you found it necessary to calculate the rock pressures and the open flows of the wells in the year of abandonment, did you not?

A. No, I found it necessary to estimate them, not calculate them.

[fol. 5399] In other words, I made a great many calculations that I did use as a guiding factor, but the answer is an estimate.

Q. Now, I would like to have you state the rock pressures of the Company's wells and gas purchase wells in Area "A" in the year of abandonment.

A. Now, then, your question; I believe, was that you wanted me to give you the abandonment pressure of the wells located in Group Area "A". Is that right?

Q. Yes, for the Company's wells and the gas purchase wells.

A. The abandonment pressure of the wells located in Group Area "A" will vary at the time of abandonment. I cannot give it to you in exact pounds, because it will vary probably with each well.

Q. Well, you mean you cannot supply the figures by individual wells?

A. No, I can't supply you with an estimated figure for each well. I do not have that. I assume that the average for all wells would be in the vicinity of 50 pounds.

Q. Mr. Hinton, the figures that I am endeavoring to elicit are those which appear in your working papers, File No. 11.

A. Yes, they are. There is a list of figures in File No. 11 that shows the average working pressures at the well head for various years and applies to the average of the [fol. 5400] total number of wells and does not apply to individual wells.

Q. Now, in your working papers, File No. 11, you have a sheet which shows Texas Company wells; Group "A", and shows the rock pressures and open flows for the wells in that group from the years 1942 through 1957. Is that correct?

A. It shows estimated rock pressures for the average of all wells in that group.

Q. Now, by "average of all wells," do you mean the average of the company-owned wells and the wells of vendors who sell to Panhandle Eastern?

A. No, because there are many of the wells from which gas is purchased from other vendors that now have rock pressures which are considerably below those shown in this working paper for the year 1948.

Q. Well now, what wells have you included in your working papers for Area "A"?

A. I have included 15 wells owned by the Panhandle Eastern Pipe Line Company, and 19 wells which are owned by the Huber Petroleum Company.

Q. And you have estimated the average rock pressure in the year of abandonment, have you not, for those wells?

A. Yes.

Q. What is the rock pressure in the year of abandonment for those wells?

A. The average rock pressure for all Company wells [fol. 5401] located in that area will be somewhere around 90 pounds, average.

Q. You are now speaking of the Company wells?

A. I am speaking of the Company wells located in Group Area "A".

Q. Isn't it closer to 93 pounds?

A. As shown on this working paper, it is 92.5, but it doesn't necessarily mean that they will be abandoned at 92.5.

The reason that I have picked that pressure for those wells is because the back pressure, open-flow curves indicate that the average potential on those wells at that date will be down to a point where it will be impossible to take gas in commercial quantities from them for a long-distance pipe line.

Q. And what is that average open flow in M.c.f. for 24 hours as of the year of abandonment?

A. As read from the back pressure, open-flow curves, it is 1,700,000 cubic feet.

Q. And the figure which you just gave of 1,700,000 cubic feet of open flow and of 92.5 pounds abandonment rock pressure is as of what year? A. 1956.

Q. Now, when you use the term "rock pressure", to what are you referring?

[fol. 5402] A. The shut-in well-head pressure.

Q. And not the pressure at the sand face? A. No.

Q. Very well.

Now, will you give us the comparable rock pressure and open flow estimates for the Company wells in Group Area "B" in the year of abandonment?

A. That is somewhat difficult to do, because Group Area "B", in my opinion, will have a closed-in well-head pressure which will be above the time or above the pressure required to make that a commercial-producing well.

Q. Well, suppose you read the figures from your working paper which are the ones you used in making this estimate, Mr. Hinton.

A. Just as soon as I finished what I was going to say.

It is not yet determined whether it will be profitable for us to keep our pipe line system operating for the small total amount of gas that was could obtain, therefore, the abandonment pressure will be dependent upon the time that we abandon the pipe-line system as a whole.

Q. Now, will you give me the figures that are shown in your working papers which represent your estimate?

A. I believe I have just explained that I do not know what they will be. I can give them to you for various years, as I have them on this working paper, or I can give [fol. 5403] them for any specific year which you ask.

Q. Are you speaking of Area "B"? A. Yes.

Q. Well, let's have the year of abandonment.

Mr. Culton: He has explained that he hasn't selected a year of abandonment in that area.

By Mr. Littman:

Q. Well, let me have those figures for the year 1956, which is the date on which you testified Panhandle Eastern is going to abandon them.

Mr. Culton: We ask that counsel read what the witness testified.

By Mr. Littman:

Q. Is it your testimony that Panhandle Eastern is going to cease operations in the Panhandle Field in 1956?

Mr. Culton: Just read that and see what he said about 1956.

"Whether it will be economical for this company to continue to produce gas after deliverability declines to 7 billion cubic feet in 1956 is problematical."

Then, he says: "Therefore, it is my judgment that Panhandle Eastern will not be justified in further producing gas from its reserves in the Panhandle Field longer than 15 years from the present."

I was reading from Page 40, Exhibit 42, showing that he [fol. 5404] was talking about the economics of the situation.

By Mr. Littman:

Q. And Mr. Biddison then comes along and accepts Mr. Hinton very literally and abandons the project on December 31, 1956, in the Panhandle Field.

Well, just give us the figures for 1956. We will argue these matters later in a brief, probably.

A. All right. The rock pressure, the closed-in well-head pressure for the year 1956 will be approximately 145.5 pounds, as shown in working papers from File No. 11.

Q. Your working papers?

A. Yes, my working papers.

Trial Examiner: Is that an average of a large number of wells?

The Witness: No, there are not so very many wells in that group area. There are five wells located in Group Area "B" at the present time, with two potential locations.

By Mr. Littman:

Q. And what is the open flow of those wells?

A. The average open flow for the wells in Group Area "B" in 1956 is estimated to be 3,160,000 cubic feet.

Trial Examiner: At the present time, as appears from your pressure map, there is no part of your Area "B" in which the indicated rock pressure is less than 350 pounds?

The Witness: That is the band between the 400 and [fol. 5405] 350-pound pressure isobar.

You will, also, note, Mr. Examiner, that there still remains a high-pressure area to the west of Group "B" in which there is very little development to date.

By Mr. Littman:

Q. Now, will you give us the comparable figures for Area "B" in the year 1959, which are shown in your working papers?

A. The pressure shown for 1959 is 96 pounds

Q. And what is the open flow for that year?

A. 1,590,000, assuming that the characteristic of the well does not change.

All open flows which I have down here are based on the assumption that the characteristic of these wells will not change.

Q. Now, will you give us the comparable figures for the wells in Group Area "C" as of 1956?

A. The pressure in 1956, closed-in pressure, will be approximately 98 pounds.

Q. And the open flow?

A. 2,240,000 cubic feet.

Q. Now, what are the figures for the year 1958?

A. 60 pounds closed-in well-head pressure.

Q. And the open flow for 1958?

A. 1,880,000.

[fol. 5406] Q. Cubic feet. A. Cubic feet.

Q. Now, will you state the estimate for Group Area "D"?

A. For Group Area "D", it is estimated that the closed-in well-head pressure will be 54.5 pounds.

Q. In the year 1956? A. Yes.

Q. And what about the open flow?

A. It was too small to take into consideration.

Q. You didn't calculate it? A. No.

Q. Will you state the 1956 estimate of rock pressure and open flow for the wells in Group Area "E"?

A. 88.5 pounds and the open flow will be 2,200,000 cubic feet.

Q. And what is the estimate in the last year shown in your working papers, to-wit, the year 1957?

A. 66 pounds closed-in well-head pressure, and the open flow is 1,525,000 cubic feet.

Q. Will you state your estimate, as shown in your working papers, for the wells in Group Area "F" for the year 1956?

A. Yes. I think it will be around 83.5 pounds and the open flow based on the average will be 5,238,000 cubic [fol. 5407] based on the present characteristic of the well.

Q. You have also estimated in your working papers the closed-in well-head pressure and open flow for the

wells in Group Area "F" down to as late as 1960, have you not?

A. No, sir, 1957 is the last year.

Q. For Group Area "F"? A. Yes, "F".

Q. Now, will you give us the figures for that year?

A. The closed-in well-head pressure for the year 1957 will be approximately 60 pounds.

Q. And the open flow in the year 1957?

A. It will be 3,285,000 based on present well characteristics.

Q. Now, will you give us your estimate for the year 1956 for the wells in Group Area "G"?

A. I think they will be approximately the same as "F", being a closed-in pressure of 86.5 pounds for 1956, with an open flow of 2,175,000 cubic feet per well.

Q. What estimate do you have for the year 1957 for the wells in Group Area "G"?

A. A closed-in well-head pressure of 63 pounds with an open flow of 1,125,000 cubic feet.

Q. Mr. Hinton, you were going to supply certain information with respect to capital additions which you anticipated were going to be installed in the year 1944; [fol. 5408] which are itemized in your Exhibit 42 under the anticipated load.

A. Yes, also for the year 1942, because the amounts which were read into the record previous to this date were from memory and subject to correct.

I believe at that time we agreed that they could be corrected at a later date if they were found to be in error.

Q. Yes, would you mind proceeding with the year 1944, which is detailed beginning on Page 29 of Exhibit 42?

Now, I would first like to have your description of Item "J" on Page 30, "Construct Well Lines Connecting Five Oklahoma Wells and Five Kansas Wells, Costing \$16,820."

A. The lines included under Item "J", Page 30, Exhibit 42, are described in more detail as follows:

The Gloden, commencing near the center of Section 36, Township 5, Range 13 and extending to a point near the center of Section 36, Township 5, Range 13, Texas County, Oklahoma, a 4-inch line 1 of one mile in length.

The Interstate Cattle Company, the line will start at a point near the center of the west half of Section 11, Township 4, Range 13, and extend to a point near the center of the south half, Section 11, Township 4, Range 13, Texas County, Oklahoma, a 4-inch I. D. line, .27 of one mile in length.

Another Interstate Cattle Company line will commence near the center of Section 14, Township 4, Range 13; and [fol. 5409] will extend to the northwest quarter of Section 14, Township 4, Range 13, Texas County, Oklahoma, a 4-inch I. D. line, .46 of one mile in length.

The Interstate Cattle Company line starting near the center of Section 16, Township 4, Range 13, and extending to a point in the southwest quarter of Section 16, Township 4, Range 13, Texas County, Oklahoma, a 4-inch I. D. line, .30 of one mile in length.

The Tudor, that line will start near the center of the east half of Section 6, Township 4, Range 15, and extend to a point near the center of Section 6, Township 4, Range 15, Texas County, Oklahoma, a 4-inch I. D. line, .28 of one mile in length.

The lines which will be constructed in the State of Kansas during the year 1944 are described as follows:

The Cottrell, commencing at a point near the center of Section 27, Township 30, Range 38, and extending to a point in the southwest quarter of Section 26, Township 30, Range 38, Grant County, Kansas, a 4-inch I. D. line, .60 of one mile in length.

The Morgan, starting near the center of the northeast quarter of Section 22, Township 33, Range 39, and extending to a point in the southwest-one quarter of Section 23, Township 33, Range 39, Stevens County, Kansas, a 4-inch I. D. line, .80 of one mile in length.

[fol. 5410] The Moser, starting near the center of the south half of Section 34, Township 33, Range 38 and extending to a point near the center of the south line of Section 28, Township 33, Range 38, Stevens County, Kansas, a 4-inch I. D. line, 1.23 miles in length.

The Reynolds, starting near the center of Section 20, Township 31, Range 36, and extending to a point on the west line or near the west line of Section 20, Township 31, Range 36, Stevens County, Kansas, a 4-inch I. D. line, .50 of one mile in length.

The Witt, starts near the center of the north half of Section 26, Township 30, Range 38, and extends to a point in the southwest quarter of Section 26, Township 30, Range 38, Grant County, Kansas, a 4-inch I. D. line, .65 of one mile in length.

Q. Does that complete the description of the well lines in Oklahoma and Kansas expected to be installed in the year 1944? A. Yes, it does.

Q. Now, will you please give us a detailed description of Item "L" appearing on Page 30 of Exhibit 42, "Construct additional gathering lines serving new wells in Hugoton Field, costing \$207,951"?

A. Yes. The additional gathering lines required in Oklahoma to extend the general gathering system to enable [fol. 5411] the connection of wells drilled during that year will be as follows:

The Interstate Cattle gathering line will start near the center of Section 22, Township 4, Range 13, Texas County, Oklahoma, and extend to a point in the southwest quarter of Section 16, Township 4, Range 13, Texas County, Oklahoma. That will be a 6-inch I. D. line, 1.3 miles in length. Tracey S. W., that will start near the center of Section 36, Township 5, Range 13, Texas County, Oklahoma, and will extend to a point near the center of Section 22, Township 4, Range 13, Texas County, Oklahoma, a 10-inch I. D. line, 4.5 miles in length.

The Kansas gathering lines required, that is, to extend the gathering system in the Kansas portion of the Hugoton Field to enable the connection of wells drilled during 1944 or proposed to be drilled, will be as follows:

The Cottrell, it starts in the northeast one-quarter of Section 4, Township 31, Range 38, Grant County, Kansas, and extends to a point in the southwest quarter of Section 26, Township 30, Range 38, Grant County, Kansas. It is an 8-inch, I. D. line, approximately 1.5 miles in length.

Of course, all of the distances given are approximate, because, without scouting the ground, it is impossible to make the exact proper allowance for surface measurement.

The Reynolds will start near the northeast corner of [fol. 5412] Section 6, Township 31, Range 36, Stevens County, Kansas, and extend to a point near the one-half west line of Section 20, Township 31, Range 36, Stevens County, Kansas, an 8-inch I. D. line, 3.3 miles in length.

The Witt starts at a point located in the northeast [quarter] of Section 5, Township 31, Range 37, Stevens County, Kansas, and extends to a point in the northeast quarter of Section 4, Township 31, Range 38, Stevens County, Kansas. It is a 12-inch, I. D. line, which will be approximately 4.7 miles in length.

The Rickart Block is a loop line which loops part of the present gathering system, and that will start at a point in the southwest quarter of Section 5, Township 34, Range 38, Stevens County, Kansas, and extend to a point in the northeast quarter of Section 23, Township 34, Range 39, Stevens County, Kansas. It will be a 6-inch, I. D. line, 3.6 miles in length.

The Buddenburg, that is, also, a loop to the present pipe-line system, and will commence at a point near the northeast corner of Section 22, Township 33, Range 38, Stevens County, Kansas, and extend to a point near the center of the north half of Section 19, Township 33, Range 38, Stevens County, Kansas, a 10-inch, I. D. line, 3.3 miles in length.

The Morgan—that is a new line, and the first three mentioned at also new lines—will start at a point in the [fol. 5413] northeast quarter of Section 19, Township 33, Range 38, Stevens County, Kansas, and extend to a point in the southwest quarter of Section 23, Township 33, Range 39, Stevens County, Kansas. It is an 8-inch, I. D. line which will be 2.4 miles in length, approximately.

Q. Mr. Hinton, you show for the anticipated load that you expect to drill 72 wells in the Hugoton Field between the middle of 1941 to the end of 1946. Is that correct?

A. I don't remember the total, but if it is written in the testimony there, that is correct.

Q. That is the result of my addition of the number of wells shown for each period in the Hugoton Field.

Now, can you state how many of those wells are required to be drilled by reason of leasehold requirements?

A. Yes.

Q. All right.

A. None.

Q. Why are these wells required to be drilled?

A. Not as a present leasehold requirement, but as a requirement that has been put upon us by the fact that our leases have been top-leased by other companies.

Mr. Lee: Pardon me. What do you mean by "top-leased"?

The Witness: I mean that other companies have taken leases on acreage which we now hold by delayed rentals, which will become effective upon the date our lease expires and the only way that it is possible for us to hold that acreage as a part of our reserve is to drill before the expiration date of our lease.

Mr. Lee: Then, what happens to their top lease if you drill?

The Witness: They have spent some money for which they will receive no benefit, the company that has done the top-leasing.

By Mr. Littman:

Q. Now, is it this so-called top-lease condition that will cause you to drill these 72 wells?

A. No, not altogether, because there are only 14 of those wells included in the 72.

Q. 14 of which kind included?

A. Of the 72 that you mentioned to be drilled in the Hugoton Field.

Q. Well, you mean 14 of the 72?

A. Have been top-leased to date.

Q. Have been top-leased to date? A. Yes.

Q. What about the rest of them?

A. From time to time, of course, it is going to be necessary to drill wells to augment our supply and to furnish anticipated requirements.

We have in all cases, where possible, tried to pick leases [fol. 5415] which would expire, because by drilling before expiration date, we would not be forced to pay a renewal bonus which is prevalent, become more prevalent, in the Hugoton Field at this time.

Q. Now, in 1942, you expect to drill 20 wells in the Hugoton Field, do you not? A. Yes.

Q. Now, will you give us a breakdown of leases as between those which are required to be drilled to top-leasing, and how many are required to be drilled by reason of the fact that you do not wish to pay a renewal bonus, and any other classes that may exist?

A. The list that shows the leases which have been top-leased is now over at the hotel. I laid it out while trying to get my files in better order over the weekend, because I did not anticipate needing it and—just a moment, I believe I can give you that.

Of the 20 wells which are proposed to be drilled during the year 1942, the following 14 have been top-leased at this time—

Q. (Interposing). You don't have to name them. I just wanted you to tell me how many of the 20 wells which you propose to drill within the next year, are wells which are required to be drilled by reason of the top-leasing condition. A. 14.

[fol. 5416] Q. And what about the remaining six?

A. Well, it so happens that to supply our peak-day requirement, we would have to take more gas than would be possible for us to get from our present system, even after the capital expenditures have been made that are set out in Exhibit 42 for the future estimated load.

In order to get the amount of gas required to supplement what we could get with the capital additions outlined for the Panhandle Field—I should confine that to the Panhandle Field—

Q. (Interposing) I am asking you about the Hugoton Field.

Mr. Wheat: He hasn't quite finished.

The Witness: Yes, but a while ago, I said, after the capital expenditures shown in Exhibit 42 had been made.

and part of this Oklahoma pipe line system in the Hugoton Field is included in that capital expenditure.

Do you see what I am getting at?

By Mr. Littman:

Q. I think I understand what you mean.

A. Of course, we can't tell exactly what size wells we are going to get there, but in order to give us the amount of gas that we want at Liberal station, it will be necessary that we are able to take from each well approximately 1,500,000 cubic feet per day.

[fol. 5417] Q. Now, Mr. Hinton, do I understand, then, that you are drilling 14 out of the next 20 wells in 1942 primarily because you are confronted with a top-leasing situation and, in addition thereto, you are drilling another six wells because you need additional gas over and beyond that which you will secure from the first 14 that I mentioned?

A. Yes, this is right.

Q. Now, there are 12 wells that are contemplated to be drilled in 1943 in the Hugoton Field. Will you give us the breakdown for those?

A. You are speaking now about the future load?

Q. Yes.

A. Ten of those wells are for main-line supply, and are located in the Hugoton Field or the portion of the Hugoton Field located in the State of Oklahoma.

These wells will be drilled in order to help supply the peak-day requirement and, inasmuch as the gathering system laid out in 1942 was designed so that we could take more gas as required at a future date, that is the logical place for us to augment our peak-day requirement at the least cost.

The other two wells mentioned are to help supply the Argus Natural Gas Company market, and they will be drilled in the Kansas portion of the Hugoton Field.

There are none of these wells top-leased to date.

Q. In other words, all of these twelve wells in 1943 [fol. 5418] are required to be drilled in the Hugoton Field, in your opinion, in order to meet the anticipated load requirements?

A. That is correct, and the locations were chosen from the standpoint of the greatest deliverability, rather than from the standpoint of the expiring leases in this year.

Q. What about the eleven wells that you propose to drill in the Hugoton Field in 1944?

A. Five of those wells will be located in Oklahoma, none top-leased, and five will be drilled in the Kansas portion of the Hugoton Field, and one will be drilled to help supply the demand of the Argus Natural Gas Company.

Q. So that none of these are to be drilled in 1944 by reason of a top-leasing situation?

A. That is correct.

Q. But because you feel it is necessary to drill those wells in order to meet the anticipated load requirements?

A. That is right.

Now, of course, the Texas wells are a different proposition all the way through.

Q. Yes. Well, all of the 15 wells contemplated to be drilled in the Panhandle Field are going to be drilled because of the top-leasing situation that you have described?

A. No.

Q. Or because of lease requirements?

A. Because of expiring leases and the renewal bonus [fol. 5419] being what it is in the Panhandle Field today, it is cheaper for the company to drill those wells than to take a chance of losing the leases or to be confronted with a stiff renewal bonus.

That applies to 13 of the wells and, as I have mentioned before, the two wells which are to be located on the State land are not included in this classification.

Mr. Culton: It gives you a longer amortization on the expense of drilling those particular wells, does it not, rather than to have waited to the last field to drill?

The Witness: Not only that, it helps to reduce our operating expense somewhat.

[fol. 5420] By Mr. Littman:

Q. Suppose you give us the details of Item "E" for the year 1944, on Page 29 of Exhibit 42, before we go to the capital additions for the year 1942.

A. The well lines which will be required to connect wells proposed to be drilled in 1944 I described as follows:

The Hendrix starts near the center of the north half of Section 4, Block PMc, E. L. and R. R. R. Survey, and extends to a point near the center of Section 10, the same block and the same survey, Moore County, Texas. It is a 4-inch, I. D. line, 2.10 miles in length.

The Kilgore starts near the center of Section 8, Block [fol. 5421] PMc, Survey E. L. and R. R. R. R. and extends to a point near the center of Section 10, the same block and survey, Moore County, Texas. It is a 4-inch line, 1.10 miles in length.

Another Kilgore line will start near the center of Section 10, PMc, Survey E. L. and R. R. R. R., and extends to a point near the center of Section 10, the same block and survey, Moore County, Texas. It is a 4-inch line and will be .05 of one mile in length.

The State C. R., that line will start at a point in Section 101 of Block 47, H. and T. C. Survey, and extend to a point near the center of Section 100, Block 47, H. and T. C. Survey, Potter County, Texas. It will be .50 of one mile in length.

Another State well, C. R.—that is Canadian River—that starts at Section 105, Block 46, H. and T. C., and extends to a point in the north part of Section 106, Survey 47, H. and T. C. Survey, Potter County, Texas. It is a 4-inch, I. D. line, .90 of one mile in length.

Q. Now, going to the capital additions for the year 1942, under the anticipated load, I refer to Item "E" on Page 27, "Lay well lines for five new wells in Panhandle Field, costing \$13,395."

Will you give the description of those lines?

A. The five lines which will be required to connect [fol. 5422] lines which the Company proposes to drill during the year 1944 are described as follows:

The Brown will start at a point near the center of Section 104, Block 44, H. and T. C. Survey, and extend to a point near the center of Section 64, Block 44, H. and T. C. Moore County, Texas. It is a 4-inch line, which will be approximately 1.50 miles in length.

The Jester will start near the center of Section 18, Block 6-T, T. and N. O. Survey, and will extend to a point near the center of Section 64, Block 44, H. and T. C. Survey, Moore County, Texas, a 4-inch I. D. line, approximately 1.50 miles in length.

The Kilgore will start at a point near the center of the southeast quarter of Section 28, Block 44, H. and T. C. Survey, and will extend to a point near the center of the south half of Section 28, Block 44, H. and T. C. Survey, Moore County, Texas, a 4-inch, I. D. line, .30 of one mile in length.

The Kilgore, again, will start near the center of Section 29, Block 44, H. and T. C. Survey, and extend to a point near the center of the south line of Section 57, Block 44, H. and T. C. Survey, Moore County, Texas. It will be a 4-inch I. D. line that will be .20 of one mile in length.

The Walker-Allen, this line will start near the center of Section 6, Survey M-1, and will extend to the north half [fol 5423] of the northeast of Section 5, M-1, Moore County, Texas. It will be a 4-inch line, 1.25 miles in length.

Q. Mr. Hinton, you gave us a description the other day of Item "G", shown on Page 27 in Exhibit 42, did you not? A. Yes, I did.

Q. Was there anything you wanted to add to that description?

A. I couldn't say, until I check back and found out what I had already given.

Q. In Item "G" on Page 28 for the year 1942, you have the construction of 20 new well lines costing \$47,610. Would you please state the total length of those well lines and the sizes of pipe, without going into the details of the individual wells in this instance?

A. Yes. All wells, well lines shown to be constructed to connect those 20 wells will be 4-inch, I. D., and the

total length of the connecting lines of the 20 wells is estimated to be 14.69 miles.

Q. Will you please state the sizes of pipe for Item "G", the trunk/gathering line looping the present line from Hansford station south a distance of 31.1 miles?

A. Yes, that will be 22-inch, O. D. pipe.

Q. Now, will you state the size of pipe and the length of the pipe for Item "G" on Page 27 for the year 1942 which relates to the looping of existing lines and additional gathering lines?

A. I was under the impression that that was the one which you just asked me about, the 31.1 miles.

Q. Well, I asked you about Item "G" a moment ago. Now, I am asking you about Item "H".

A. I understood you to say "G".

The loop line from Sneed, the intake side of Sneed compressor station to Windmill Junction will be 26-inch, O. D. pipe.

Q. And what is the distance? A. 2.7 miles.

From Windmill Junction to Zofness Junction, also a loop line, will be a 24-inch, O. D. pipe, a distance of 8 miles.

From Zofness Junction west along our present system will be a loop line that will be 20-inch, O. D. pipe, 6.33 miles in length.

The further extension of this line, looping our present system to the west, will be a 16-inch, O. D. pipe, 3 miles in length. There will be a gathering line which will start near the center of the south line of Section 57, Block 44, H. and T. C. Survey, and extend to a point near the center of Section 29, Block 44, H. and T. C. Survey, both in Moore County, which will be an 8-inch, I. D. line, which will be 1.2 miles in length.

[fol. 5428] C. H. HIXTON a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Mr. Littman: If your Honor please, I would like to have marked for identification with the next exhibit num-

ber, a table entitled, "Estimated Intake Pressures at Sneed Compressor Station."

I might state that this table contains certain data and information requested by me to be furnished by this witness during the course of his cross-examination.

Trial Examiner: This table will be marked for identification as Exhibit No. 139.

Exhibit No. 139 Was Marked For Identification.)

Mr. Littman: I would like to have marked for identification with the next exhibit number a table entitled, "Estimated Average Working Pressures at Well Head (Gauge), for 'Group Areas', shown on Exhibit 46, Panhandle Field, Texas", which table was furnished by this witness at my request, which request was made during the course of cross-examination.

Trial Examiner: This will be marked for identification as Exhibit No. 140.

[fol. 5429] (Exhibit No. 140 Was Marked For Identification.)

Mr. Littman: I would like to have marked for identification as Exhibit No. 141, a table entitled, "Annual & Cumulative Production from Panhandle Field, Texas", which has been furnished by this witness pursuant to a request made by me during the course of cross-examination of this witness.

Mr. Wheat: This consists of two pages, does it not?

Mr. Littman: Yes.

Trial Examiner: The exhibit will be marked for identification as Exhibit No. 141.

(Exhibit No. 141 Was Marked For Identification.)

Cross-Examination (Continued)

By Mr. Littman:

Q. Mr. Hinton, I would like to have you refer to Exhibit No. 140 for identification.

Now, this exhibit shows your estimate of the average working pressures at the well head for the Company wells

and gas purchase wells for the years 1942 to 1960, inclusive, is that right?

A. That is correct.

Q. And this is under the anticipated load basis?

A. Yes.

Q. Now, it is possible for the company to so operate its production system as to raise or lower these estimated working pressures, is that correct?

[fol. 5430] A. By the addition of equipment, that is is correct. Without the addition of equipment, we are limited to certain limitations.

Q. In other words, these working pressures are predicated upon certain estimates which you made of capital additions and equipment required to maintain these pressures?

A. Through the year 1946, that is correct.

Q. How did you arrive at them after the year 1946?

A. I carried the same idea down, generally speaking, but assumed that in the event that certain wells were unable to produce their proportionate share of the total production, that additional horsepower would be installed or the situation would be taken care of by revamping the pipeline system which would directly affect the type of well mentioned.

Q. Well, do I understand you to say that you expect additional facilities to be installed after 1946 in order to maintain the working pressures shown in Exhibit No. 140?

A. I expect additional equipment to be installed to enable certain wells to meet these working pressures as set out in Exhibit 140.

Q. Do you have the amounts of additional capital expenditures for those years?

A. No, I do not, because it would be impossible to lay your finger directly on where this additional horsepower will be required.

[fol. 5431] The only way that that could be worked would be to assume that every well in the field in each group area would have the same pressure drop year after year, and that will not happen.

Q. Then you did not make any estimate, in dollars, of the amount of capital additions that will be installed in order to secure these average working pressures shown in Exhibit No. 140, after 1946?

A. I did not make any dollar estimate, but I know that it is going to require considerable additional money.

Q. Well, can you give us some general idea, in dollars, of how much money it is going to require?

A. No, sir, that is another one of those "crystal ball" estimates.

Q. That you made?

A. Yes.

Mr. Culton: You made no attempt to determine capital expenditures after five years?

The Witness: No, because when you go beyond the five-year period, then you are going to encounter ever-changing characteristics of these wells.

The pressure drop on the wells is not going to be the same for each well in the field at all and, therefore, it would be impossible to go years into the future past 1946 and be able to make any accurate estimate of capital expenditures that will be required.

By Mr. Littman:

Q. How about a general estimate, in dollars, of how much will be required by way of capital additions for each of the years subsequent to 1946?

A. Well, that is a pretty tough question because, in order to answer that, I would have to figure out the cost of tubing for most of the wells. I would have to figure out the cost of installing many individual well-compressors and we do not know yet how much it is going to cost us to maintain wells as the pressure goes down.

We do know that we are going to have a great deal more water trouble as this pressure declines. That is evidenced by what is happening in the low-pressure wells in the field at this time.

What years that is actually going to happen, I cannot say. If I was going to lay aside money to make the necessary capital expenditures which I believe necessary, just offhand thinking about well after well, it would not be less than a quarter of a million dollars.

Q. Per year?

A. No.

Q. Do you mean after 1946?

A. Yes.

Q. In addition to the five years of capital expenditures [fol. 5433] for the anticipated load which you have set forth in Exhibit 42?

A. Yes, and the sum that I mentioned does not take care of the change of the cylinders on the compressors at the Sneed compressor station.

I feel sure that that change will have to be made sometime after the year 1946.

Q. Well, how much more than a quarter-million dollars of capital additions would be required after 1946 to maintain these working pressures shown on Exhibit No. 140?

A. I cannot say. I do not know the cost of the changing of the cylinders.

Q. And you cannot give us any idea of the cost, above a quarter of a million dollars?

A. No, but that is just a very, very rough estimate, subject to a more detailed study.

Q. Now, I am correct in stating that these average working pressures which you assumed for purposes of your study and which are shown in Exhibit No. 140, could be lowered by the installation of additional capital facilities, is that right?

A. Yes, if we wanted to spend the money, why, we could probably work against as low as 70 pounds.

Q. (Interposing) In what year, Mr. Hinton?

A. Any year.

[fol. 5434] Q. Any year?

A. Yes. If we wanted to spend the money, but it certainly would be just like throwing it out the door to develop in that manner.

Q. Well, I was not talking particularly about a figure of 70 pounds. I was speaking about lowering these pressures beyond the figures shown in Exhibit 140.

It could be done by the expenditure of additional money for capital additions, is that right?

A. Yes, that is right; but going back, we anticipate or estimate that we have so much gas in our reserves in that

field, and it is not the intention of Panhandle Eastern to try to obtain a greater amount of gas than is actually contained or was originally contained in the reserves.

If we would go to pressure like that, it would mean that we would be taking amounts of gas per year that would be far in excess of what we should be taking for the reserve which we hold in that field.

Q. Well, Mr. Hinton, it is an engineering fact, is it not, that the reduction of these pressures through the years shown in Exhibit No. 140 would have the effect of increasing Panhandle Eastern's production through those years. Is that correct?

A. You say the reduction of these pressures?

Q. Yes.

[fol. 5435] A. Shown on Exhibit No. 140—

Trial Examiner: Read the question, please.

(Whereupon, the pending question was read by the reporter.)

The Witness: Yes, anytime that a well is enabled to work against a lower working pressure, it will have the ability to deliver a greater quantity of gas.

By Mr. Littman:

Q. And the quantities of gas which you, in fact, have estimated to be recovered under your anticipated load are predicated upon the average working pressures shown in Exhibit No. 140. Is that correct?

A. Yes, which is all tied back into the geological data.

Q. Didn't you testify earlier on your cross-examination that one of the major reasons why you were not interested in securing more gas from the Panhandle Field was because you did not have the market?

A. That is right.

Q. And not because you could not get additional gas out of the Panhandle Field if you wanted to?

A. No, but you cannot take any one of those things and set it out by itself. It has to be a coordinated plan of development and operation throughout.

Any time you take any one part of this problem and set it [fol. 5436] out to itself without coordinating with the other things involved, you lose track of the answer.

Q. Well, Mr. Hinton, I take it from the answers that you have given this morning that you are unable to give us the unit cost of producing gas in the Panhandle Field by Panhandle Eastern after 1946?

A. Without making further study that is right, and that could not be carried on far beyond 1946 at this time accurately, but an estimate could be made that would follow the path rather closely which we will be forced to follow.

Q. And the same answer, of course, would apply for any unit cost which would reflect the unit cost at the well head?

A. Yes, that is right. They are all estimated costs.

Trial Examiner: Mr. Hinton, I think perhaps Mr. Littman may have some questions that will bring this out, but let me ask at this point whether you have studied the production of natural gas in other older fields in the United States.

The Witness: Yes, I have, in two of the older fields.

Trial Examiner: What are those?

The Witness: One being the East Kansas-West Missouri Field, more commonly referred to around Kansas City as the Mo-Kan area and the Louisiana Field, I have given some study.

I was formerly in the Louisiana Field, several years ago and, of course, I have somewhat of an interest in it and I [fol. 5437] have watched it somewhat.

Trial Examiner: That is specifically the Monroe territory?

The Witness: Yes.

Trial Examiner: Is the Missouri-Kansas area still producing?

The Witness: Yes, it is.

Trial Examiner: That is part of your Local Area?

The Witness: That is correct. At this time, we have approximately 550 wells connected to our pipe-line system from that area.

Trial Examiner: Have you abandoned any wells in that area?

The Witness: Well, I would say that we have probably abandoned a thousand wells in the last ten years.

Trial Examiner: In what area?

The Witness: In the Mo-Kan area. That is scattered pretty well all over. The major part of the gas in Missouri comes from Cass County and Jackson County.

We only have one well in—I cannot remember whether it is the Ray Well in White County or the White Well in Ray County—and the Kansas production comes from Anderson, Linn, Franklin, Miami, and I believe we have just a little bit in the corner of Wyandotte County.

Trial Examiner: What is your initial pressure in this [fol. 543:] Local Area field?

The Witness: The initial pressure in the Local Area field varies. The top production in that field, the pay section, is commonly called the Squirrel Sand. I think that is more or less a local name.

The deeper gas comes from what is termed the Bartlesville Sand, but there is considerable doubt whether it is the true Bartlesville Sand or not. It seems to be a scattered type of production and the pressure is, I would say, or the range of pressures encountered in the drilling-in of these wells, has varied from 30 pounds and, as I can remember, the highest pressure that I have observed was in the Rantoul district of 260 pounds.

As the wells are drilled, if two or three pays are encountered, there will oftentimes be a variation of several pounds between the top pay that is encountered and the bottom pay.

Trial Examiner: And what has been the usual abandonment pressure?

The Witness: That again varies. We have wells in the Blue Springs area that now produce against a pressure as low as 5 pounds.

The total monthly production from those wells hardly ever gets up to 100 M. c. f. for the month. Some of them are down as low as one M. c. f.

[fol. 5439] Trial Examiner: Is the problem of delivering from a gathering system into the transmission system, having in mind the pressures back of the intake, affected by the structural factors of the field or the geographical location of the field?

In other words, is the problem different in one field [what] what it is in another as to the deliverability of the gas from gathering systems into a transmission system?

The Witness: Yes, I would say that it is quite different in this respect.

As an example, the Town of Blue Springs is furnished by wells during the summer months which do not have to produce against a pipe-line pressure greater than five pounds.

Of course, a great deal of gas is used around Kansas City for house heating and in Blue Springs, and in the winter time, as the demand becomes larger, then the pipe-line pressure has to go up in order to be able to furnish that town its supply and the wells are turned off for the winter months.

Of course, if wells of that nature were forced to feed or if the market terminals required high pressure, why, then they would no longer be used at all.

Trial Examiner: Well, the factors that you have mentioned relate rather to the market and the requirements of the market rather than to limitations in the characteristics of the source, do they not, the source of the gas, I mean? [fol. 5440] The Witness: I am not sure that I followed that correctly, but I believe that it is the terms of the relationship of the source to the pipe-line system, am I right?

Trial Examiner: Yes, the thought I had in mind was to inquire whether, if you desired to deliver gas into a transmission system at any given pressure, the source of the gas behind the intake serving that transmission system would be affected by the nature of the field from which the gas originates, or by geographical location; and if so, in what manner?

The Witness: By the ability of the gas to flow through the porous media. In other words, if the gas had to be

taken and furnished to a transmission system at a high pressure in order to make that pay, of course, [horse-power] would have to be installed and the rate of flow from that well would be, in all probability, so great that in tight areas, it would not have the ability to migrate through the formation into the well bore in sufficient quantities to maintain a usable intake pressure for the well compressor units where it would be a first stage boost from the compressor up to the main transmission line.

Trial Examiner: So that when you are discussing the closed well pressure, that can have no great significance unless you know the character of the formation?

The Witness: That is absolutely correct.

[fol. 5441] Trial Examiner: And relate it to the quantity withdrawn?

The Witness: Yes, sir, because the closed-in well pressure is a pressure that is observed after the gas has had a considerable length of time to migrate into the well bore and as the rate of pull from that well exceeds the ability of the gas to flow into the well bore which is governed almost entirely by its permeability times the thickness of the pay, why, then the well falls off in its deliverability because, instead of working at an observed well-head pressure, it is going to work against a stabilized flow pressure which can only be determined when the pressure gets to the point where we can tell how fast it is going to flow through the formation.

The ability of gas to flow through formation is governed by, I believe, the same as pipe-line formulas. That is, the fundamental part of it being the difference in the square of the pressures and the difference in the square of 400 pounds and 300 pounds is a great deal more than the square between 200 pounds and 100 pounds, and I think that we are going to find that the ratio of flow through these formations in the Panhandle Field and in the Hugoton Field are going to be in about the same proportion as the difference, in squares, at these two pressures named.

Trial Examiner: And when you are serving a high-pressure transmission line, you are working under sharp [fol. 5442] limitations of the withdrawal factor?

The Witness: That is correct.

Trial Examiner: As compared with a condition where you are serving a low-pressure transmission system?

The Witness: Where the rate of flow is comparatively low. Does that answer your question, sir?

Trial Examiner: Well, it indicates clearly that the withdrawal pressure is a factor that, in your judgment, is related strictly to the conditions, both geological and as to transmission requirements and market requirements, and would not necessarily be the same, nor the factors governing it, the same in fields in which there has been longer experience.

The Witness: I would say the fields where we have had longer experience would be no criteria for these two fields, because the Missouri-Kansas field is a sand producing formation, whereas the greater portion of our gas comes from Lime-stone, Dolomite and Granite Wash and in the Panhandle Field, and Limestone, largely, in the Hugoton Field.

Trial Examiner: And from the conservation standpoint, it would necessarily follow that the rapid removal of the reserves of the Panhandle Field, at least, would be wasteful?

The Witness: Yes, I feel that if the rate of withdrawal in fields of this nature is large enough that it pulls a low-pressure area within the field, the same as can be observed [fol. 5443] on the rock pressure map, Exhibit 26, to the Northeast side of the field there, I think that as the moisture is dropped out of this gas at these lower pressures, that portions of the permeability are clogged.

I have in mind that that is somewhat of a capillary attraction through the formation, and from a conservation standpoint, I believe that the greatest amount of gas could be obtained from a field of this nature if it were possible to operate that field so that there could be no low-pressure areas pulled within the field at any place.

By Mr. Littman:

Q. Mr. Hinton, on Page 40 of Exhibit 42, you make the statement:

"Therefore, it is my judgment that Panhandle Eastern will not be justified in further producing gas from its

reserves in the Panhandle Field longer than 15 years from present."

Are you sure about that?

A. I am sure that that is my judgment.

Q. Are you certain about your judgment?

A. If my judgment did not lead me to believe that that was not approximately correct, I certainly would not say it.

Q. You are positive about the fact that Panhandle Eastern will not be justified in further producing gas from [fol. 5444] its reserves in the Panhandle Field longer than 15 years from the present, are you?

A. I am positive that that is my judgment of the time when the pressures will get down to the point indicated. The time element does not mean so much to me as the pressures.

Q. Are you sure about the time, 15 years?

A. Undoubtedly, that fifteen years is correct if it is in here, because that is the result of my judgment.

Mr. Goodman: By your judgment, do you mean according to your best knowledge and belief?

The Witness: Yes, sir.

Mr. Goodman: That is what you mean?

The Witness: Yes, sir.

Mr. Goodman: You think that it will not pay to extract gas from the Panhandle Field, according to your best knowledge and belief, beyond 15 years from the present?

The Witness: That is correct.

Mr. Goodman: And do you have in mind, also, certain conditions which would extend that time?

The Witness: Yes, there are many conditions which could arise which would extend that time. Any condition that would tend to curtail the amount of gas withdrawn would affect the total life of the field.

Mr. Littman: Would extend the life of the field?

The Witness: Any curtailment of withdrawal would [fol. 5445] extend the life, yes sir.

Mr. Goodman: Do you have in mind any conditions that would permit further withdrawal of gas beyond the quantities which you have estimated and beyond the 15-year period?

The Witness: Yes. If the manufacturer of carbon black was outlawed in the State, why, it would have a very strong influence on the field. Likewise—

Mr. Culton: (Interposing) By extending or shortening the life of the field?

The Witness: Extending, if it is curtailed. Likewise, if the line to Milwaukee, Wisconsin, now proposed and I believe awarded to the Phillips Petroleum Company, which was not considered in this study, was built and that gas was taken largely from the Panhandle reserve which, in all probability, it will be, why, then my calculations would be in error in the amount of the gas that Phillips takes.

Mr. Culton: Would that lengthen or shorten the life?

The Witness: That would shorten the life of the field.

Cross-Examination

By Mr. Goodman:

Q. Are there any other factors that would increase your ability to take gas beyond what you have estimated, either as to amount or as to time?

A. No, I cannot think of any that would affect it in that manner. If there should be placed upon the west sweet [fol. 5446] field a proration order, it would, in all probability, mean that the total amount of gas which we expect to get from that field would be decreased.

Q. Could you conceive that your rate of pressure decline might change?

A. Yes, I think it can go off more sharply than I have shown, because we have based that on present formation characteristics and, as this becomes lower, I feel that there is going to be considerable stoppage of the channels through the formation, better known as permeability, and the reason that I say that is that a very complete study of this water situation has been made in the Panhandle

Field by Mr. Hammerschmidt of the Texoma Natural Gas Company, and his conclusions lead me to believe that that is what is going to happen and, keeping in mind that we are speaking about the observed well-head pressure and not the equilibrium pressure, I would like to point out that at the time when we experience fairly low pressures at the well head; that there will be areas of much higher pressure which are located between the well bores.

Q. I am not sure that I understand your answer because, first you indicated that the pressure decline, or you indicated you could conceive that the pressure decline would accelerate more rapidly than you indicate.

A. Yes.

[fol. 5447] Q.—And toward the end, you mentioned factors which I interpreted as limiting the rate of pressure decline.

A. No, that would hasten it; because there will, without doubt, be great quantities of gas trapped in the Panhandle Field which will never be recovered, and to complete the answer to your question, the result of the lowering of the pressure in this field may produce a condition whereby the flow of gas through the formation will be decidedly retarded, thus giving a lower observed well-head pressure for the same rate of withdrawal.

Q. Are there any known processes to overcome this factor of impermeability at low pressures?

A. Yes, there are, but they are not far-reaching enough from the well bore to produce the result that would entirely do away with that situation.

Q. What are those processes?

A. The treatment of Limestone with hydrochloric acid.

Q. And you have resorted to that, have you not?

A. Yes.

Q. To what effect?

A. With an increase in the deliverability of the wells at the present pressures.

Q. And to what extent have you applied that treatment to existing wells in the Panhandle formation or in the Panhandle Field?

[fol. 5448] A. I believe that there is somewhere between 50 and 60 of the wells connected to our system that have been treated with acid.

Q. And to what extent does it pay to repeat or keep on that treatment?

A. From the only experience that I have had, I am [afraid] that we are not going to get good results by the repeating of acid treatment.

I refer to a treatment which was made on our Master-son 1-38 well in 1937, and the treatment was made by following the acid into the formation with a gas load. That is, a compressor was set up at the well head and the weight [and the weight] which forced the acid back into the formation was a straight gas load and that well never did clean up as we felt that it should have.

In other words, you can go out and open the well and still smell the spent or partially spent hydrochloric acid, so this year I put a treatment in that well of 2,000 gallons of 7½ percent acid and followed it with 6,000 gallons of water in an effort to clean out the area which had been acidized before and the result was that, to date, we have not received any gain in deliverability or open flow of that well.

Q. Is acidization the only known process of overcoming the factor of impermeability?

A. Well, that question would have to be answered in [fol. 5449] this respect or in this manner: There is another method of opening up the formation around the well bore, but that method is not as far-reaching as acid treating.

Q. In other words, acidization is the best known method?

A. Yes. The other method I referred to is the shooting of the well with nitroglycerin.

Mr. Culton: That is rather dangerous to the well in some formations, is it not?

The Witness: Yes, a well that has been shot with nitroglycerin will have a maintenance cost that is much higher than a well that has not been shot at all, and a well that has been treated with acid will show a lower maintenance cost than a well that has not been treated at all.

Mr. Culton: That difference is largely due to cavings?

The Witness: That is true, the cracking of the formation around the well bore, and particles falling off into the well bore.

By Mr. Goodman:

Q. You have mentioned your experience with old and exhausted and abandoned wells, is that right?

A. What is it?

Q. You have mentioned some experience in old, exhausted and abandoned wells, is that right?

A. Yes, in our Mo-Kan area.

[fol. 5450] Q. What type of area is that, that is, as to general capacity, small or large? A. Small.

Q. It is a small area?

A. Yes, not comparable with the Panhandle or Hugoton areas at all.

Q. In other words, it is quite a limited area and the conditions are not those found pertaining to the Panhandle area?

A. That is correct.

Q. Now, is the Louisiana area comparable?

A. In some respect, it is, but the size of the reservoir, the number of acres above the reservoir, is only a fractional part of the Panhandle Field.

Q. In other words, then, Panhandle is an individual case and its probable future is really speculative, isn't that so?

A. Yes, I would say that it is speculative, and giving the field the best of its possibilities, the greater part of the speculation lies on the under side.

Q. Is there such a thing affecting the migration of gas as a rate of permeability? A. Certainly.

Q. And have you considered such a factor in determining your judgment that the field will, in all probability, [fol. 5451] be abandoned in 15 years?

A. I have not said the field in all probability would be abandoned in 15 years.

Q. You have said that Panhandle Eastern would cease producing?

A. Yes, I feel that we can do better to produce our gas elsewhere at the end of 15 years, rather than make a capital expenditure that could be used for such a short time.

Q. Now, within 15 years, Mr. Hinton, there is a chance of the factor of rate of permeability helping conditions, isn't that so?

A. That has been given very thorough consideration.

Q. By whom?

A. By me, in my studies.

Q. To what extent?

A. To placing my idea of what the pressures will be through the various years.

Q. Where do you show that?

A. In my pressure curve.

Q. Well, in an exhibit that is—

A. (Interposing) I do not remember whether they were put in as an exhibit or not.

Q. Just a minute. Does that show in connection with your curve of rate of pressure decline? Is that factor evaluated in any way?

[fol. 5452] A. Yes, it is.

Q. In what way?

A. I refer you to Group Area "A" of Exhibit 46. The pressure drop in this group area would have been shown to be much sharper if it were not for the fact that there is comparatively low permeability in this particular area.

I give, for example, our Burnett wells located in Section 1-86 and Section 108 of Block 5, I & G.N. Survey, Carson County, Texas. There exists at this time a gradient of pressure from Burnett 1-86 to Burnett 108, a distance of approximately two miles, that is over 100 pounds.

Mr. Colton: Does that mean it is tight in there?

The Witness: That means it is very tight in there. The fact that when these wells are blown to atmosphere for testing or conditioning that we oftentimes take a pressure gage and put on as soon as the well is closed and then record the pressures at various intervals, usually 5, 10, 15, 20, and then we may skip and go on to an hour or two hours or three hours, and we find that the wells, in general, in this area, are slow to regain their closed-in well-head pressure, whereas the wells located over in this section of the field, referring to Group Areas "G" and "F", show that there is, in general, high permeability in that portion of the field.

Trial Examiner: That is, you mean an equalized pressure is more quickly reached?

[fol. 5453] The Witness: That is correct, yes, sir.

Does that answer your question, Mr. Goodman?

By Mr. Goodman:

Q: Yes.

Now, in considering tendencies toward pressure equalization, how much of a time interval have you taken into consideration?

A. It is my opinion that when well-head pressures get down to 100 pounds or below, that it is not going to be very successfully carried on to produce a well greater than one-third of its total well hours, or, in other words, one-third of each month.

Q. Now, Mr. Hinton, you have distinguished between abandoning a field and seeking to produce gas. I presume you mean that you will maintain the power to produce some gas after the 15-year period?

A. That remains to be seen.

Q. In other words, you do not rule out the field for purposes of some ultimate production or use even at the end of 15 years, do you?

A. No, I think that it is possible that we could get some gas from a few of our wells, but by the time we paid the operating expense and the taxes on that property, why, I think the cost per M.c.f. would be far greater than that which we hope to receive for it at the purchase end of the line.

[fol. 5454] Q. Do you have in mind any particular use for the field after the 15-year period?

A. Yes. I think it will be used for short-distance pipe lines up to the time that the gasoline plants in the sour field have taken the greater portion of it and then the medium-distance lines will be abandoned and there will still be a great deal of gas left there for local consumption where the time element will not be important in the migration of that gas in areas away from the well bore into the well bore.

Q. In other words, there will be considerable productivity of the field but at a relatively low rate of output?

A. That is correct.

Q. So that at the end of the 15-year period, the field itself and your leases on the field might conceivably have substantial salvage value?

A. Yes, I think there will be some salvage value there.

Q. In other words, you could sell your rights, is that right?

A. No, I think you could probably turn the pulling of the pipe over to somebody for half of the value of the pipe.

Q. Well, the wells themselves would be capable of some production?

A. Yes, but here is the thing: At that stage of the [fol. 5455] depletion of the field, the companies that are connected to short-distance pipe lines will still be connected to their own development and as we cease to take gas from our acreage, there is certainly no reason why they should pay us any money for it, because as they take their gas away, what little we have left is going to eventually migrate over there to the extent it would not be a paying proposition for them to make a cash outlay for our acreage holdings.

Mr. Culton: They would also have to operate the pipe lines from our acreage over—

The Witness: (Interposing) Yes, and pay the taxes on it.

By Mr. Goodman:

Q. Now, in the figuring that you have done, and to the extent that you have done, have you given any consideration to all of the salvages realizable when you stop production in the Panhandle Field?

A. No, sir, that problem has not been given to me.

Mr. Goodman: That is all.

Cross-Examination.

By Mr. Lee:

Q. You said something about at the termination of the 15-year period, you would have to take your gas from elsewhere. What did you mean by that?

A. I mean that I believe that we can produce gas more cheaply and protect our reserve in the proper manner by [fol. 5456] switching production to the Hugoton Field

rather than continuing to produce that same amount of gas at a much higher cost which would have to be passed on to the public if we continued to operate in the Panhandle Field.

Q. Then do I understand that the idea that you have is that—at the present time you are working both of the fields?

A. That is correct.

Q. But you give a far greater life to the Hugoton Field?

A. Yes, sir.

Q. And do you give that greater life to the Hugoton Field considering you are working both fields now?

A. Yes, the total withdrawal from the Hugoton Field is less than 300 billion cubic feet right now, whereas the annual withdrawal from the Panhandle Field is more than twice the total withdrawal from the Hugoton Field to date.

Q. How much longer after the 15-year period would the life of the gas available go on?

A. Considering the number of acres which we have in this study, it is my opinion that we would not be safe in estimating a life longer than 25 years for that field.

Q. Is that 25 years beyond the 45 years or 25 years from the present?

A. 25 years in total.

[fol. 5457] Q. Now, of course, this estimate does not take into consideration any possibility of added acreage, does it?

A. No, sir, it does not.

Q. And is there a possibility of acquiring additional acreage that would tie into the Hugoton Field?

A. We are endeavoring to do that now as a safety factor.

Q. Then that 10-year period of life that you ascribe to the Hugoton Field beyond the 15 years you have ascribed, or it is vice versa, isn't it—yes, that is right—the 10-year period of life you have ascribed to the Hugoton Field beyond the 15-year life you ascribed to the Panhandle Field is subject to to an increase, to-wit, the 10-year period referred to by reason of the acquisition of additional acreage, isn't it?

A. That is correct, and I based by 10-year opinion on observations made in that field by me.

Q. Well now, in view of the fact that you think the reserves, so far as obtaining them in an economical manner in the Panhandle Field is concerned, will be limited to a 15-year period. Is that why your company is not seeking any further acreage in the Panhandle Field?

A. No, not exactly, Mr. Lee. It is a complicated problem to fit all of these different moves in, in such a manner that will enable the company to obtain the greatest amount [fol. 5458] of gas for the least cost.

Q. Now, generally speaking, without too much detail, I understand that you have limited the life of the Panhandle Field but you have great faith in an additional life for the Hugoton Field.

Therefore, is your company negotiating to acquire any more of the Panhandle Field now?

A. No.

Q. And that is the underlying reason for it, isn't it?

A. Yes, because the time that we would operate in that field would not be greatly affected by the addition of more acreage.

Q. And in addition to that, you are negotiating to enlarge your Hugoton Field because of the longer expectancy of life?

A. Life, that is correct, and certain facts that have come to light the past year on testing, makes us feel at this time that it is probably a good idea to add more acreage just as a matter of having a safety factor.

Q. Now, let's assume that you did add that acreage in Hugoton Field, and let's assume that the Panhandle Field has been abandoned.

The 15 years has rolled around. Are you going to have a source of supply equal to what you have now?

A. Yes, we will have if the acreage is as we hope it is. [fol. 5459] Mr. Lee: That is all.

Cross-Examination (Continued).

By Mr. Littman:

Q. Mr. Hinton, is it your testimony that Panhandle Eastern Pipe Line Company will abandon its facilities in the Panhandle Field in the year 1956?

A. That would be my idea, that we would do away with our present system and utilize the pipe which now carries gas out of the Panhandle Field to other portions of the Hugoton Field where it will be needed.

Q. In 1956? A. Yes.

Q. And it is your testimony that Panhandle Eastern will not operate in the Panhandle Field after 1956?

A. Not as a long-distance pipe line.

Q. How will they operate in the Panhandle Field?

A. I do not know, that is something that would have to come which we do not know, and the reason I say that, they may be making silk stockings out of gas by 1956, and we might use it for that purpose.

What I mean is, there are a lot of things that can happen in the use of natural gas that we do not know about today and they undoubtedly will happen.

Q. Then you cannot testify that Panhandle Eastern will, in fact, abandon its facilities and operations in the [fol. 5460] Panhandle Field in the year 1956, can you?

A. As a long-distance pipe line company, I can say that that is going to be very close to the time.

Q. But you cannot say that as to their operations as a natural gas company?

A. Yes, I could say that as to their operations as a natural gas company. Any other use that is made of our natural gas, I feel would have to be in another category other than long-distance pipe line light and fuel sales.

Q. You are not saying that Panhandle Eastern could not continue to operate in that field after 1956 as a long-distance pipe-line company?

A. Not if they would choose to make disadvantageous expenditures.

Q. Now, you have stated the primary reason for your 1956 abandonment, to-wit, is the economics in that year, am I correct?

A. Yes, that is correct.

Q. And the economics of the year 1956 is, of course, dependent upon the capital expenditures required to produce gas in that year, is that right, in large part?

A. Yes, I believe that you said that correctly.

Q. And you have made no study of that, have you?

A. As to the amount of capital expenditure required to produce gas after the year 1956?

[fol. 5461] Q. Yes.

A. Not in a detailed manner. It has been given considerable study.

Q. By whom?

A. By me.

Q. And what is the unit cost of the gas in 1956, according to your considerable study?

A. I am not able to name a probable unit cost of gas in 1956 after considerable study.

Q. Now, will you tell me how you can determine the economics of operation in 1956—

A. (Interposing) Common sense.

Q. (Continuing) —and after 1956, without knowing the unit cost in that year. You say, “common sense”?

A. Yes.

Q. How about the “crystal ball” you referred to a minute ago? Does that help you to get the answer too, Mr. Hinton?

A. I do not have to refer to the crystal ball in this instance.

Q. Not in this instance.

Now, you can say that you can tell without knowing the unit costs of operations in 1956, you can tell whether it is economical to operate?

A. Yes.

[fol. 5462] Q. You can. Now, how?

A. By just taking the operating expense and going back to the amount of gas that we would be able to take from these wells, assuming that the characteristics did not change on the wells, and they are not going to remain the same, and just putting those few things together, the amount of fuel required, the number of engine hours required to transport that amount of gas will—I just do not feel that I would even give it the consideration to go to a unit cost, because it is beyond the realm of good economics.

Q. Well, your idea of good economics and my idea of good economics and other people's idea of good economics may differ, Mr. Hinton.

Now, I want to know specifically what you considered, in dollars and cents, to arrive at your economics? I want you to tell me what your economics consist of.

A. I cannot give it to you in dollars and cents. My economics consist of going through the operations required and the amount of capital expenditure that would have to be installed to raise the volume that we could take from that field to a point where it would prove that we could not take gas cheaper from the Hugoton Field than there.

Q. That kind of general statement may satisfy you, Mr. Hinton, and may satisfy others, but it does not satisfy me.

Is that all the specific information that you can give us [fol. 5463] at this time with respect to the method and manner by which you arrived at your economics of abandonment in 1956?

A. I believe that is sufficient.

Q. That is the best you can do?

A. Well, as far as I am concerned, that is sufficient, and until proven otherwise by somebody else, I am going to stand on it.

By Mr. Littman:

Q. Now, you had no trouble in arriving at this kind of general conclusion.

A. What do you mean I had no trouble?

Q. That you had no difficulty in arriving at the conclusion that Panhandle Eastern will not economically be able to produce gas in the Panhandle Field after 1956, did you?

A. Not a great deal.

Q. All right. And you also had not a great deal of difficulty in arriving at the very opposite conclusion, to-wit, that every other operator and every other pipe-line company in the field will be able to operate at full blast and at 100 percent of its 1948 capacity in 1956?

[fol. 5464] A. No, I think that is reasonably what will happen, as I have explained. The type of market for the use of the gas other than Panhandle Eastern is decidedly different than our picture in that field.

Q. You made no study in dollars and cents with respect to the economics of the operation of the other companies, did you, in the Panhandle Field?

A. Yes, I gave consideration to that and knowing it is just a choice with those companies, whether they want to continue to operate for another two or three years at a high cost of operation and make a little money, or our decision whether we want to continue to operate and try to make a reasonable profit as we are today, by moving into the Hugoton Field.

They have no reserve in Hugoton Field and their choice has to be whether they choose to make a little money or go out of business.

Q. All right. What is the unit cost of operation in the Hugoton Field in 1956 for Panhandle Eastern?

A. Considerably lower than it is in the Panhandle Field.

Q. In dollars and cents, please.

A. I cannot give it to you in dollars and cents.

Q. Can you come within 100 percent up or down, within the correct figure in dollars and cents?

[fol. 5465] A. Yes, I imagine I could.

Q. Have you made the calculation? A. I have not.

Q. Well, if you have made no calculations, what is it, a kind of loose estimate?

A. Any estimate has a certain degree of looseness, and especially long-distance estimates can be off.

Q. Now, in order to determine whether or not it is going to be economical for Panhandle Eastern to abandon its facilities in the Panhandle Field in 1956 and produce all of its gas out of the Hugoton Field, you must necessarily arrive at the conclusion that it is going to be more expensive to operate per M.c.f. in the Panhandle Field than in the Hugoton Field in 1956. Is that correct?

A. You say it is going to be more expensive to operate in the Panhandle Field than in the Hugoton Field?

Q. I am speaking of unit costs. Will it cost more per unit?

A. Yes, I think that has been definitely stated many times.

Q. All right. Let's have the unit cost of operation in the Panhandle Field in 1956 and let's have the unit cost of operation in the Hugoton Field in 1956. Do you know those?

A. No, I do not know them in cents, and I do not believe that anybody can give them exactly.

[fol. 5466] Q. Now, you made no study, in dollars and cents, of the economics of all other pipe line companies who, according to your judgment, will be able to blithely go along producing 100 percent of their peak requirements right down through the year 1956. Is that correct?

A. No, I did not, because I know more what type of markets that type of gas is going to be used for. I know those companies are going to be forced to make tremendous additional capital expenditures before 1956 occurs, and by making those additional capital expenditures, they will have them there available.

We are making our capital expenditures, outside of the minor expenditures, on the basis of trying to obtain from our reserve the probable amount of gas underlying them.

Q. Now, if these companies, these other pipe-line companies, did not make these tremendous capital expenditures through the future years, they would not be able to get the quantities of gas that you have estimated will be withdrawn by them in the future years?

A. That is right. Texoma would not be building their new station over just west of our Sneed station at this time.

Q. And the life of the Panhandle Field would be extended beyond the 15-year period, would it not?

A. As far as the life of the Panhandle Field, it would extend it. As far as the life of the Panhandle Eastern [fol. 5467] Field, it would not greatly influence it, because as soon as they stopped, we would take advantage and get that part of the gas that we could.

Q. That is your idea.

Mr. Wheat: When you said Panhandle Eastern Field, you meant the portions of the field in which Panhandle Eastern obtains its gas?

The Witness: Yes.

By Mr. Littman:

Q. You mean it would not affect Panhandle Eastern's picking up its stakes in 1956?

A. Not noticeably, no.

Q. If the field continued to operate for an additional ten years beyond 1956, you are still of the opinion that Panhandle Eastern would abandon its operations in the Panhandle Field in 1956?

A. Yes, because we will be producing gas at a lower cost in the Hugoton Field at that date.

Q. And in arriving at that conclusion, you made no—

A. (Interposing) Dollars and cents—

Q. (Continuing)—calculations of dollars and cents, did you?

A. Not per M.c.f., I did not.

Q. And you have no working papers to show how you arrived at it, do you?

[fol. 5468] A. No, I do not believe I need them.

Q. It is just a kind of a general idea, is it, of yours?

A. No, it is just something that anybody with any knowledge of the gas business knows is going to happen.

Q. Mr. Davis does not know it, does he? At least, he has not testified to it.

Mr. Culton: He said 15 years.

Mr. Littman: He did not.

Mr. Culton: In the last letter he filed, he did.

The Witness: I do not know.

Mr. Culton: He said he thought we had enough for 15 years and counsel knows it.

Mr. Littman: There is no such testimony in this proceeding, Mr. Culton, and that is the thing to which I am referring, is this record.

I am not talking about red herring prospectuses, to use the term which your own witness used.

Mr. Culton: Go ahead, go ahead.

By Mr. Littman:

Q. And Mr. Davis, in estimating approximately 70 per cent greater reserves in the Panhandle Field, is wrong, and you are right, is that a correct statement?

A. In my opinion, my estimate is more nearly correct than Mr. Davis', but that is no reflection on Mr. Davis be-
[fol. 5469] cause without any doubt, he is one of the best

geologists and engineers throughout the United States as far as a general knowledge of every gas field in the United States is concerned.

Q. And his estimate of the remaining reserves in the Panhandle Field is 70 percent greater than yours, is that correct?

A. Did you take time to sit down and figure out the reservoir content required to hold that much gas?

Q. Mr. Hinton, I am asking you the questions. I am not being cross-examined.

Did Mr. Davis find the remaining reserves of the Panhandle Field as of the end of 1940 over 70 percent greater than your estimate?

A. I believe that is what you said the other day. I had not seen that estimate before, as I remember.

[fol. 5470] By Mr. Littman:

Q. Mr. Hinton, in response to one of Mr. Lee's questions, you undertook to give an estimate of the life of the Hugoton Field, did you not?

A. Yes, I believe I gave it for a number of years.

Q. Now, I would like you to furnish us, since this is an entirely new subject for you in this proceeding, with all of your working papers showing the methods, manners and figures used by you in arriving at this estimate for the life of the Hugoton Field.

Do you have them with you?

A. I do not.

Q. Where are they now located?

A. I do not have working papers. That was an estimated figure.

Q. Now, I want you to tell us how you arrived at it, giving us the figures and the bases of your estimate, that is, if you propose to undertake to testify in this proceeding with respect to the life of the Hugoton Field.

[fol. 5472] The Witness: I believe that I have told you several times that I have made no detailed estimate, but by observing the characteristics of the field based on the data which we have gathered, and knowing, in general,

what we could probably expect to happen in that field, I would say that in order to protect the interests of the Company, that capital expenditures at this time should be made on the basis of expecting to take gas from the Hugoton Field for a period of not longer than 25 years.

By Mr. Littman:

Q. Are you a geologist, Mr. Hinton?

A. No, sir.

Q. Now, will you give us the annual withdrawals that are expected to be made from the Hugoton Field from now to the day of death of its life, 25 years hence?

A. I will be happy to give them to you if it is possible for me to obtain them.

Q. Don't you have them among your working papers?

A. No, sir, I have them for no longer than a period of the next five years.

Q. You have no figures beyond the next five years?

A. No. That is all I could get from the Committee for Conservation, five years.

Q. Well, what figures with respect to annual withdrawal [fol. 5473] drawals beyond the next five years did you use in arriving at this estimate of 25 years?

A. I used the amount of gas that Panhandle expects to withdraw from that field, and I can tell you in very short order that the problem in the Hugoton Field is going to be different than it was in the Panhandle Field, because we are not going to have the great benefit of migratory gas in that field.

We are going to be governed much more closely by the amount of gas in place.

Q. Well, let's have your withdrawal figures for Panhandle Eastern.

[fol. 5474] A. I believe there is an exhibit here, somewhere.

Mr. Culton: Mr. Morton's exhibits are the ones you are talking about, and they are for 15 years.

The Witness: It will be very easy to give because we have arrived at a constant load at the end of the 15-year

period, and that entire amount will be withdrawn from the Hugoton Field for the next 10 years, estimated.

By Mr. Littman:

Q. Now, where is this load for the next 15 years? Where does that appear in evidence? In one of the exhibits?

A. I believe so.

Mr. Culton: Exhibit 132.

The Witness: Those fields were divided in one of those exhibits and showed the percent that we expected—yes, that is shown in Exhibit 131, and for the next 10 years the amount of gas which Panhandle Eastern will expect to take from the Hugoton Field will be 117,031,551 M.c.f. per year.

By Mr. Littman:

Q. 117 million or 115 million? A. 117 million

Q. Where does that figure appear in Exhibit 131?

A. That is the total and we do not anticipate taking any more gas from the Panhandle Field after this period [fol. 5475] has been reached for the main line and, therefore, the total Hugoton Field withdrawal will be that amount.

Mr. Goodman: What paper are you reading from?

The Witness: Exhibit 131.

Mr. Goodman: I see. All right.

The Witness: From the column shown as "Total" under the "Total Main Line".

By Mr. Littman:

Q. Now, Mr. Hinton, the figures which you have read are not your estimates of withdrawals, are they?

A. No, those are Mr. Morton's estimates.

Q. And Mr. Morton hasn't testified to any such figure as 117 million M.c.f. in this proceeding, has he?

A. No, but he has furnished me with that estimate and it is in my working papers.

Mr. Culton: And that was put in evidence by Mr. Littman, wasn't it?

Mr. Littman: Oh, yes, as a part of your working papers?

The Witness: Yes.

By Mr. Littman:

Q. For the purpose of showing how you arrived at certain figures long prior to 1960? A. Yes, sir.

Q. Now, Mr. Morton did testify in these proceedings as to the amounts of sales for Panhandle Eastern for the [fol. 5476] next five years or 5½ years through 1946, I believe, did he not?

A. Yes, at least that far.

Q. And this so-called 25-year life is based upon a stepping up of the annual production beyond 1946 to as high as 117 million M.c.f. Is that right?

A. Yes, shown in the figures just requested by you.

[fol. 5477]. By Mr. Littman:

Q. At any rate, the 25-year so-called estimate of yours is predicated upon the annual total main line sales shown in the extreme right-hand column of Exhibit 131?

A. Yes, under the total, which is the last column of the group of three, shown as the "Total Main Line."

Q. And what reserves are you using in arriving at this 25-year estimate?

A. I am not using anybody's reserves because there is no reserve figure that has been established that will show that we can take that amount of gas from our acreage.

Q. And you made no such study, did you? A. Yes.

[fol. 5478] Q. What? You did make a study showing how much gas you can take from your reserves?

A. I know how much we can take down until the end of 1960 from an estimated reserve.

Q. Where are your working papers for that?

A. I shall try to find them in my intricate filing system.

Q. Don't bother to do it now.

A. I have it all worked out by percent, total estimated amount of reserve withdrawn by years. I think that is in the miscellaneous working papers.

If you would rather go on, I would be glad to look that up.—I know I have it—and show you the percent figures.

Q. Did you make the calculation after 1960 to get to the end of the 25 years?

A. No, I went and talked to the management about acquiring some more acreage, and that is what we are doing at this time.

Q. In arriving at this so-called estimate with respect to the life of the Hugoton Field, did you assume a decelerating rate of production per pound drop of decline in rock pressure?

A. No, I don't think that we will experience the same type of [deceleration] as we are experiencing in the Panhandle Field at this time.

[fol. 5479] Q. You are going to have a new kind of variation from the application of Boyle's Law in the Hugoton Field?

A. I have never testified that there was any variation from Boyle's Law in any respect, and I would like it now to be understood that I am not questioning Boyle's Law in any manner whatsoever.

Q. Mr. Hinton, you didn't listen closely to my question. I said from the application of Boyle's Law.

A. I thought you said, "deviation," I am sorry.

Q. Deviation from the application of Boyle's Law to the data at hand?

A. No. Again, the pressure decline problem in the Hugoton Field for the Panhandle acreage will show a decidedly different trend than it does in the Panhandle Field of Texas, in my judgment.

Q. Well, maybe I can get at it in another way.

You were not requested by the company to make any estimate of the life of the Hugoton Field, were you, for purposes of this proceeding?

A. I don't recall. I am always making estimates of the probable life of the field and I am telling you that I just can't remember whether anybody asked me to or not, but I did a tremendous amount of work on the Hugoton Field and tried to apply the proper judgment on what the trend will be, based on the present data which has been obtained.

[fol. 5480] Q. Well, you didn't make any such study for the Hugoton Field as that which you have presented in this proceeding for the Panhandle Field, did you?

A. No, it would not be possible to make that type of estimate for the Hugoton Field at this time. The total amount of gas that has been withdrawn from that field to date is only about two percent of the total estimated reserve for that field.

Q. Mr. Ralph E. Davis has stated in a letter, addressed to the Panhandle Eastern Pipe Line Company, which is in evidence in this proceeding, that the life of the Hugoton Field was more than 25 years. Do you agree with that statement? A. Oh, absolutely.

Q. You do?

A. Yes. The life of the Hugoton Field will, in all probability, be far beyond 25 years, but the amount of gas which Panhandle Eastern has under lease and developed at this time will not last more than 25 years for the rate of withdrawals which we expect to have.

Q. I think I now understand your testimony, Mr. Hinton, that you are confining your 25-year estimate for Panhandle Eastern to the present reserves, to-wit, the gas acreage under lease presently by Panhandle Eastern and the leases subject to present gas purchase contracts? [fol. 5481] A. Yes, the length could be governed by State regulation.

Q. I am afraid I don't understand the latter part of your answer.

A. I say, the time element could be governed by State regulation.

Q. And Panhandle Eastern, as you have already suggested, is going to go out and secure more reserves, are they not?

A. Yes, but in the even that we did have a proration order placed upon that field, which we would be forced to operate under, it would in all probability require that we connect a large number of wells which would be drilled by other vendors in order to furnish the amount of gas which we would require to supply our market demand.

Q. And, of course, the acquisition of more acreage and the acquisition of more reserves in the Hugoton Field would extend the 25-year period which you gave?

A. Yes, I hope so.

Q. And the reasonable expectation is that it would extend the 25 years?

A. Yes, the acquisition of additional acreage would have a more far-reaching influence in extending life than would the acquisition of acreage in the Panhandle Field of Texas.

[fol. 5482] By Mr. Lee:

Q. Well, if you are so certain that the Panhandle Field, that is the company-owned acreage in the Panhandle Field, will be abandoned in ten years, and if you are so certain of the life of the Hugoton Field of not less than 25 years with your present acreage and considerably beyond 25 years with your present plus acquired acreage, then isn't it only the part of common sense, in order to continue to have the gas for this pipe line, that you should and will greatly increase your Hugoton acreage holdings?

A. That would be my idea, Mr. Lee.

Q. Sure. And that means that the investment in the pipe line—I am not talking about any Local Area pipe line, I am talking about the long-distance pipe line which is going to have a source of supply for a great many years beyond 25 years from now under your own ideas, isn't it?

A. If we are able to acquire the acreage, which is becoming very scarce in the Hugoton Field at this time.

Q. Yes, but even if you do not acquire the acreage, as I understand it, you do say that the reserves are sufficient [fol. 5483] for more than 25 years that you have now?

A. I would say that 25 years would cut it to a pretty fine point, because that is the reason that it was my recommendation that we acquire additional acreage, to be sure that we could have gas for 25 years.

Q. Well, there is just one more question that I would like to ask you.

Has the Panhandle Eastern Pipe Line Company actually been engaged, within recent years, in extending its acreage in the Hugoton Field?

A. No, we have not, because it is only the past two or three years that the market trend has been as it is, and if we were to remain upon the basic market, I would say that we had a very nice acreage picture to assure a 25-year supply of gas for main transmission line.

Mr. Culton: That is, you mean the market up to a year or two ago?

The Witness: Referring back to the exhibit, I believe it is 141, which shows the amounts of gas which we expect to take under the basic load condition.

By Mr. Lee:.

Q. But just recently, at least within the last six months, perhaps nine months, you have entered into contracts that greatly enhance your market, to-wit, the contract with the Consumers Power in Michigan, haven't you?

[fol. 5484] A. Well, I don't know much about the detail of where the gas goes, Mr. Lee.

Q. Oh, but you do know this: As production manager, you know that there has been something done that is going to greatly increase the required production?

A. I certainly do.

Q. Sure.

A. But I don't know what percent goes to Consumers or any certain contract.

Q. No, but you do know that what has happened in the last nine months is that a contract has been entered into between your company and Consumers Power Company that results in a tremendous addition to your total output of gas? A. Oh, yes; yes, sir.

Q. Now, what I would like to ask you is this, just again, in view of that fact has the company been engaged, in recent months, in efforts to increase its acreage in either Panhandle or Hugoton or both?

A. We have made an effort to secure additional acreage in the Hugoton Field within that length of time stated, but no effort to increase the acreage in the Panhandle Field.

Mr. Culton: Have you actually succeeded in getting acreage?

The Witness: Yes, we have and the cost of securing that acreage is not reflected in the capital expenditure or [fol. 5485] operating cost in these studies.

By Mr. Lee:

Q. And how much was that additional acreage that you recently secured?

A. Well, I can't tell you just—

Q. (Interposing) Well, approximately.

A. Well, the acreage held by the Panhandle Eastern as of December 31, 1940, in the Texas and Hugoton fields for main line purposes was 227,845.95 acres; as of November 30, 1941, the total amount of acreage held by the Panhandle Eastern both operated and unoperated, in both the Panhandle Field and the Hugoton Field, was 254,802.69 acres.

Mr. Culton: That is an increase of how much?

The Witness: About 27,000 acres. I was going to say 30,000. That is the amount that I had in mind, but I thought I had better check it.

By Mr. Lee:

Q. Well, wait a minute. If you will pardon me, you said 227,845.95; December 31, 1940? A. Yes.

Q. And 254— A. (Interposing)—802.69.

Q. November 30, 1941? A. Yes.

Q. And what was the increase there?

[fol. 5486]. A. About 27,000 acres.

Q. That is close enough. Now then, it will be the settled policy of the company, in view of the philosophy you have given us here about termination of uses in the two fields, to go on enlarging their holdings, won't it, in the Hugoton area?

A. By a few more thousand acres, but not in any substantial increases as is reflected in the figures which I just gave you.

Q. But that will be because you will feel that when you have taken a few more thousand acres, perhaps, at the outside 35, you have got such a reserve there for so many years that you feel you can rest a while on acquisition of new preserves?

A. Yes, and we will constantly be improving our acreage picture. By that I mean, whenever possible to obtain a lease on acreage which is conveniently located to our pipe-line system, that we will take that and in the event that we feel, as time goes along, that we can safely drop some acreage to cut down expenses, we will drop less desirable acreage and keep the more desirable acreage.

Q. All of which adds up to one thing, that your continuation in business is going to be, in your judgment, under that program, for far beyond the 25-year period from the present time?

[fol. 5487]. A. I don't believe that we could justify any estimate in any gas field that has ever been discovered for a period longer than 25 years.

Q. No, but now wait a minute. You have given us 25 years to start with. Now, this enlargement of your holdings and the policy that you pursue is bound to result in the continuation of business at the present rate in excess of 25 years.

A. It was taken primarily as a safety factor and it should result in a longer life of the field in the event that in making a long-distance estimate of that nature we had not placed the proper value upon this reserve and it is much better to have a little too much than to be on the short end of the deal.

Q. I know.

Mr. Littman: You mean to have—

The Witness: (Interposing) Excess acreage.

Mr. Littman: To have a little excess acreage?

The Witness: Yes, sir.

By Mr. Lee:

Q. And it might be 30 years and it might 35 years?

A. It could be, but the data does not indicate that.

Q. What does it indicate to you, in your best judgment?

A. It indicates to me that the amount of gas that we are going to be able to take from the Hugoton Field is going [fol. 5488] to be much less than that which we are going to be able to take from the Panhandle Field, and, therefore, in order to obtain the Hugoton gas at the best conditions, it is going to be necessary to shift operations to that field at a fairly early date.

Mr. Lee: That is all.

Trial Examiner: Mr. McRee, have you questions?

Cross-Examination.

By Mr. McRee:

Q. Mr. Hinton, do you have a copy of Exhibit No. 134 there? A. Yes, I have it Mr. McRee.

Q. In arriving at your estimate for Condition "C", what factor did you take into consideration for the increase in withdrawals from 1941 during the subsequent years?

A. Estimated increases by the pipe line companies, only, and no increase in gasoline plant consumption or in the carbon black industry.

Q. I believe that Condition "C" anticipated that not only Panhandle Eastern but the other major producers in the field would experience a reasonable addition to their loads from time to time.

A. Yes, that is correct.

Q. By "reasonable additions to the load" just what did you mean?

A. Well, at the present time, it is my understanding [fol. 5489] that I am supposed to prepare at Mr. Littman's request a detail of the amounts taken by the various pipe line companies.

I believe that that came in in a package which I have not opened yet, my working papers I meant. I can hand you, or you can be furnished, a copy of that which, I believe, would answer your question.

In other words, I can't recall those figures offhand.

Q. Well, in the case of your own company, you anticipated, I assume, in Condition "A" that there would be some customers added to your line from time to time, did you not?

A. No, we just assumed that that was—

Q. (Interposing). I beg your pardon, I mean Conditions "B" and "C":

A. Yes, in "B" and "C" that was considered.

Mr. Littman: Pardon. May I interrupt to just clear up one point?

Mr. McRee: Yes.

Mr. Littman: Am I correct in stating that your Exhibit 141 shows the breakdown of your withdrawal figures under Condition "C", which are shown in Exhibit 134 in Column 11?

The Witness: Yes, they do.

Mr. Littman: That is under Condition "C" only?

The Witness: That is correct. I thought about making those for all three, but you had talked about "C" and we had agreed that we thought that that was what was going [fol. 5490] to happen, so I did not make three separate exhibits.

Mr. Littman: Well, I believe that my interrogation on cross-examination showed pretty clearly how you arrived at your annual withdrawals for Condition "B".

The Witness: Yes.

Mr. Littman: Pardon the interruption, Mr. McRee.

By Mr. McRee:

Q. Did your anticipated withdrawals under Condition "C" take into consideration that the other companies might also add customers from time to time?

A. Under Condition "C"?

Q. Yes.

A. Yes. It shows an increase for those companies for the first five years. Thereafter no increase. You will note that the amounts from 1945 through the year 1948 are constant, a total of 679,000 M. M. c. f. per year and after that date they drop off in the proportion that the Panhandle Eastern expects to retard their withdrawal.

Q. That is true, but the difference between Columns "B" and "C" would reflect the increase in load of the companies other than Panhandle, wouldn't it?

A. Yes, that is correct.

Q. So that from 1946 the other companies in the field would experience, under this estimate, an additional load of 53 billion cubic feet?

[fol. 5491] A. That is right, 53 billion cubic feet.

Q. And a similar amount during the following year?

A. You refer to the year 1947?

Q. Yes.

A. Yes, that is correct. I believe those figures are correct.

[fol. 5511] By Mr. Culton:

[fol. 5515] Q. You have named the principal pipe-line companies taking gas out of that field, have you not, out of the west field?

A. Yes, the principal ones.

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Q. Now, will [just] just outline in general—this question may be a little repetitious, but I am going to ask the same question with respect to the other companies—out, line, in general, the area from which the Canadian River [fol. 5516] and the affiliated companies supplying gas to Denver or to the South Plains obtain their gas from that field?

A. The major part of the gas used by that company is obtained from an area including the southern part of Group Area "F" and to the area immediately south of there.

Q. You are referring to the group areas marked on Exhibit 46, as well as outlined on that copy of 26 which refer to group areas?

A. That is true. Canadian River also has some development over in the west edge of Carson County.

Q. Is that along the south side of the field?

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A. North of the fault line.

Q. Is some of it in Area "A" or is it all—

A. (Interposing) No, I do not believe that Canadian River has any development over as far as the west edge of Area "A".

Q. It would be south of "B", then?

A. And in "B", also.

Q. They have some in "B" and some in "F".

They have some in "E"?

A. Yes.

Q. And the rest of theirs, in general, is south and west of those areas which we have just described?

[fol. 5517] A. That is correct.

Q. Now, where are the areas from which Texoma takes most of its gas? You have already referred us as to where a fourth of it comes from, the Canadian River properties. Where does the remaining three-fourths of Texoma's gas come from?

A. From acreage which is located in Carson County and in pretty well all over Moore County in the sweet gas area and they have, I believe, some scattering acreage right the county line, that being the county line between Moore County and Potter County.

Q. With respect to Area "G", do they have substantial acreage in that area?

A. They do. They have substantial acreage in that area and in all areas surrounding Group Area "G".

Q. How about "C"? Do they have some acres in "C"?

A. Yes, they have some small amount, but it is not in any great amount.

Q. How about "A"?

A. They have considerable acreage in Group Area "A" and also acreage to the east of Group Area "A".

Q. And from what points does Cities Service produce most of its gas?

A. From Group Area "A" and areas surrounding Group Area "A".

[fol. 5518] Q. Where does Panhandle Eastern get its supply?

A. Well, I believe the best way to term it would be to say the heart of the west sweet field.

That is, by the heart, I mean the center, in general, from an area extending over to a point on the east side in about the central northern part of Carson County and extending west into Potter County and in Moore County.

Q. Well, it is in various portions of the areas "A" to "G" shown on Exhibit 46, is it not?

A. Exhibit 26, I believe.

Q. Also on 46, is it not? A. Yes.

Q. Now, are its wells very numerous in Area "A"?

A. No, I would not call that an intensive development at all.

Q. How about "B"?

A. No, we are sparsely developed in Area "B".

Q. Where is your densest production? That is, where is your greatest number of wells for the acres involved?

A. I believe, in Group Area "G".

Q. And your principal competition in Group Area "G" is with Texoma Natural Gas Company, is that correct, so far as the area itself is concerned?

A. Yes, the Texoma Natural Gas Company, and the Shamrock Oil and Gas Company.

[fol. 5519] Q. You have some of the Shamrock wells yourself, do you not?

A. Yes, we do, some very nice wells.

Q. I notice that on that pressure map, Exhibit 26, the pressures have commenced to drop substantially in the north part of the field, up in the north central and north-eastern Moore County and northwestern Hutchinson County.

What has been the cause of that pressure drop which has taken place up there?

A. The heavy withdrawal from that area—

Q. (Interposing) For what use?

A. For the carbon black industry.

Q. The change in pressure, then, is largely the result of production of sour gas, rather than the production of sweet gas?

A. Yes, there are a number of locations to the south of the sour gas field which have not been drilled to date, thus making the withdrawal comparatively light in the sweet field immediately south of the sour gas line.

Q. What competitive companies exist in Area "F" with which Panhandle Eastern's acreage has to compete on withdrawals?

A. The Texoma Natural Gas Company and the Canadian River Gas Company.

Q. And in Area "E"?

A. Principally the Canadian River and some Texoma. [fol. 5520] Q. In Area "D"?

A. In Area "D", the Texoma and there are some wells that have been drilled in Area "D" especially just to the east of it, which were used for gasoline plant extraction in the early days of the field.

Q. What is the cause of the pressure reduction situation which now exists in Area D? There seems to have been a substantial pressure reduction in Area "D".

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A. (Continuing) That is due to the heavy withdrawal to the east and southeast and also to the north and northwest.

Q. Has the gas withdrawal from wells within Area "D", in your opinion, been sufficient to cause the pressure reduction which is shown for that area?

A. No, I do not think that the pressure reduction is entirely due to the withdrawal from the Group Area "D" proper.

Q. You think it has been influenced some by the withdrawals to the east?

A. Yes. However, Group Area "D" is not a highly productive area.

Q. What size wells are ordinarily found in that area, do you recall?

A. It is a very rare thing if a well has a natural open flow greater than 10 million cubic feet per 24 hours.

[fol. 5521] Q. Are those wells' open flows frequently increased by acidization?

A. Yes, they are. However, in this particular area, Group Area "D", we are having considerable trouble with four of our wells at this time.

It is almost impossible to get those wells free enough from water to take a back-pressure open flow test.

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Q. Now, the Area "E", what competitive conditions exist in that area?

A. Canadian River is the other company that takes gas in great quantities.

Q. So the principal competition in that area is with Canadian River Gas Company, is that right? A. Yes.

Now, in the north edge of "E", Texoma has a development but, in the south edge, it is only Canadian River.

Q. I see. You said something a while ago to the effect that the wells in the north part of the Canadian River acreage are more closely drilled than the wells in the south part of the acreage.

A. Yes, that is true.

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[fol. 5522] Q. Now, I believe you stated that in the first portion of the study which you made—first, I failed to inquire about the competitive conditions in Area "C". What other companies do you find yourself in competition with in that area?

[fol. 5523] A. Well, the Cities Service and the Shamrock, the Texoma, the Huber Petroleum Company, all have wells located in that area, but the principal competition is from the migration of gas to the lower-pressure area lying to the east.

Q. And what is the cause of that migration? What is the fundamental cause for it?

A. Because gas always flows from an area of high pressure to an area of low pressure.

Q. What has caused the low-pressure area lying to the east?

A. Well, my opinion is that the amount of low-pressure acreage shown there has been caused by the production of the gas from the Panhandle gas fields in conjunction with the oil from the Panhandle gas field.

I think there, in all probability, has been great quantities of gas produced in that manner to the area east.

Q. And what has been done with that gas?

A. It has principally been blown to the air.

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[fol. 5525] Q. Now, Area "A".

Will you tell us what the competitive conditions are in that area?

A. Area "A" supplies a great deal of gas to Cities Service and to Texoma Natural Gas Company for the Natural Gas Pipe-Line Company of America and, again, in Area "A", there is a migration of gas to the north and northeast which has, in my opinion, been retarded greatly by the fact that the data indicates that the permeability in Group Area "A" is quite low.

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[fol. 5530] Q. Mr. Hinton, along the northeast line of Exhibit 26, I see an uncolored area that has a good many dots on it. A. Yes.

Q. What is that area?

A. That is the northern part of the oil area which extends from the Town of Pampa, Texas, in a northwesterly direction to a point in central northwestern Hutchinson County.

Q. Is all of the oil area shown along that uncolored portion? A. No, it is not.

Q. What is the distinction between the oil area shown along that uncolored portion and the oil area which is within the colored boundaries?

A. That is the oil area of the Panhandle Field where no gas is encountered in the upper formation.

Q. In other words, in drilling down, they go through no gas and just hit oil, first? A. That is right.

Q. Is that a substantial acreage? A. Yes, that is.

[fol. 5569] C. H. HIXTON, a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Redirect Examination:

By Mr. Culton:

[fol. 5695] Q. I see. Now, we have been discussing the question of horsepower just a little bit. I want to go into that in a little more detail. Of course, it is a kindergarten expression that gas flows from an area of high pressure to an area of low pressure and will not flow unless there is a difference in the two pressures?

A. That is right, the same as water.

Q. Is it necessary to use methods for changing pressures so as to bring about better flow conditions?

A. You mean to create a pressure gradient?

Q. That is right, so flow will take place.

A. It is necessary.

[fol. 5696] Q. And how is that done in the operation of a pipe line?

A. By taking gas into a cylinder at a lower pressure than the pressure at which it is stored in a pipe line or tank and by moving that cylinder into an area of less cubic inches, to force the gas out at a higher pressure and thus, repeating the operation, create a pressure hole in the storage tank or pipe line and allow gas from other parts of that storage tank or pipe line to flow into the area of lower pressure.

Q. Into the area of lower pressure? A. Yes.

Q. And what methods can be used for the purpose of stepping up those pressures, that is, do you have to do it all at the end of the line or can you do part of it—I mean at the intake of the compressor station, or can you do it at the wellhead?

A. It can be done at any place.

Q. Or at any place along the line, is that right?

A. Yes, sir, that is right. The determination of the proper place is the important thing.

Q. Now, how is that determination made?

A. By obtaining the pressure drop which will occur in the pipe line system by the transportation of the required volume of gas.

[fol. 5697] Q. Is that another place where you take into consideration the economics of different methods of providing your change in pressures?

A. Yes, sir, that is. It is necessary that the development of the system be [studied] in such a manner as will permit probably the installation of one compressor station to handle several wells, instead of the requiring of the installation of a compressor station at each well.

Q. In other words, it is sometimes more economical to have a compressor at the well or at a group of wells to take that gas and put it into the pipe line at higher pressures, and in other instances it may be more convenient to have a compressor station along the gathering lines, and in other instances it might be more convenient to install your additional power at the general compressor station in which the gathering lines converge. Is that correct?

A. That is right, and unless the problem has been thoroughly studied, it will often result in the requirement that horsepower be installed under each of the plans which you mentioned, that is, namely, at the well or to handle a group of wells along the line at some point and also in at the main station.

Q. Now, of course, it is also kindergarten knowledge that, as the pressures are lowered, less volumes of gas will be in the pipe line than the volumes at the higher pressure.

[fol. 5698] What I mean is, that greater volumes of gas will cause higher pressures in the pipe line?

A. ⁶That is right.

Q. And does that principle have anything to do with the economics of operating a pipe line system as the field pressures go down?

A. Yes, it does, because, of course, as the pipe line is designed, so is the pressure drop in proportion to the size of the pipe line in relation to the volumes transported, and if the pipe line was under-designed to begin with, it means that the capacity of that line will have to be increased to carry additional volumes of gas.

Q. Now, you have testified that one method of increasing the pipe line is the addition of power. Is it sometimes necessary to increase the capacity by other methods?

A. That is right.

Q. What other methods? A. By looping.

Q. In other words, putting in more pipe?

A. By putting in more pipe.

Trial Examiner: Let me ask how many cubic feet of 14.65 gas is required to make a cubic foot of 500-pound gas?

The Witness: Do you mean how many atmospheres?

Trial Examiner: Yes.

Trial Examiner: We talk in terms of 16.4 and usually [fol. 5699] consider 30 atmospheres. It is 34.13 atmospheres.

Trial Examiner: So that approximately 35 cubic feet of gas at atmospheric pressure is compressed to one cubic foot?

The Witness: That is right.

Mr. Culton: At a 500 pound pipe line?

The Witness: Yes.

Mr. Culton: At any 500-pound pressure; where compressed to higher pressures, it would be far in excess of that?

The Witness: Yes. As that 300 would be increased by the amount of 14.65, it would mean that an additional cubic foot of gas would be stored in the same space.

Trial Examiner: So that your whole problem in filling your pipe line at Liberal is to provide a volume of gas that will produce that result and keep a continuous flow?

The Witness: Not on the intake side of the station. That is so that there will be enough gas come in that will provide that condition at the discharge side of the Liberal station, the 500 pounds.

Mr. Culton: In other words, the Examiner means you have got to get it in from your different lines in enough volume so that when it goes out, there will be enough for 500 pounds. That is the point.

Trial Examiner: That is right, and at the rate of flow the 500 pounds would produce in the pipe line.

The Witness: That is right.

[fol. 5700] By Mr. Culton:

Q. Now, are all of these questions that you have been [discussion] concerning the different methods of providing power and so forth, methods that were taken into consideration by you in determining the necessary expenses that the company would be required to incur and the necessary additional capital expenditures which the company would be required to make over the period of the next five years even to produce and transport the same volumes of gas which it now produces and transports?

A. Under the basic—

Q. (Interposing) Under the basic load.

A. That is correct, with the exception of the wells which are to be drilled in the Panhandle Field and that will lower our operating cost, in all probability, and we will make a considerable saving in the cutting out of a renewal bonus on that acreage, so I feel that the saving which the company will accomplish by drilling those will pay a nice return on the investment required.

Q. In other words, in all of these computations, you have had in mind the different things you have been discussing and have attempted to determine the most economical method under which the company should operate its properties down there, first, if it were not going to have an increase in production in markets and, second, taking into account the increases in its markets which the

[fol. 5701] company expects, as evidenced by Mr. Morton's estimate?

A. Yes, I would say that everything had been given careful consideration.

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Mr. Lee: Is your company the largest holder of acreage in the Panhandle Field?

The Witness: No. We are second to the smallest of the major pipe line companies.

Mr. Lee: And how many of the major companies hold acreage in the Panhandle Field?

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Mr. Culton: (Interposing) Name them off in the order of their ownership and acreage. That is probably what Mr. Lee would like.

Mr. Lee: I just wanted to get generally understood what your position was in that field.

Mr. Culton: I think it would improve the record if that were to be done. I suggest you name the companies in the order of acreage as near as you can.

The Witness: I do not have those acreages here in [fol. 5702] shape that I can read them readily off, but I know them.

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The Witness: In general, Canadian River Gas Company has a holding of between 205 and 210 thousand acres in the Panhandle Field.

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The Witness: The Texoma is around 160,000 acres; Cities Service around 120,000 acres and the Panhandle Eastern about 65,000 acres; and Northern Natural is about 1,000 below us, or was, the last time I counted this up, 64,000 acres.

Trial Examiner: And your holdings, as I recall, constitute approximately $4\frac{1}{2}$ percent of the total acreage?

The Witness: Yes, of the total field.

Mr. Littman: Mr. Hinton, there are at least four more major pipe line companies operating in the Panhandle Field, are there not? You named them the other day.

Mr. Culton: He named some in the east field.

The Witness: The Phillips Company in the east field there and Lone Star is out of the east field. I do not believe that I have missed any.

[fol. 5703] Mr. Culton: Consolidated, but it has only small acreage, hasn't it?

The Witness: It is not in our picture. We throw it the class of "Others." In other words, about two years ago I took all of these acreages and made a study to show how much gas Panhandle Eastern would be able to produce if the then talked-of proration order was placed upon the field which was based upon a formula of allocation, dividing the total production into two parts and giving two-thirds of the total production allocation on the basis of acres times pressure, and one-third on the basis of potential, and I believe that those companies that I named are the only ones that I included and all the other acreage was thrown in the classification of "Others."

I probably mentioned Hagy, Harrington & Marsh.

Mr. Littman: No, you mentioned, among others, United Gas Pipe Line Company. Where does that one operate and where is acreage?

Mr. Culton: They only have 18 million a day.

The Witness: It is a small acreage, but I cannot think were United goes.

Mr. Culton: I think you will find that is the one that goes to Wichita Falls.

The Witness: I get United and Lone Star confused.

Mr. Culton: Lone Star goes to points in Oklahoma [fol. 5704] from the Panhandle Field.

Mr. Littman: You mentioned Consolidated Gas Company and also the West Texas Gas Company.

Mr. Culton: Consolidated Gas Company has about 5,000 acres.

Mr. Culton: (Interposing) West Texas Gas Company is a part of the [Canadian] river setup.

The Witness: The Red River holdings and the Canadian River and the Southwest Development—

Mr. Culton: (Interposing) And the Southwest Development Company.

The Witness: (Continuing) Are all one family.

Mr. Culton: In other words, all of those companies operate either as producers or as transporters out of what you have referred to as the Canadian River acreage.

The Witness: Yes.

Mr. Culton: Which is the largest ownership of acreage in the field.

The Witness: Yes, the Canadian River Gas Company owns as much acreage as the Northern Natural and the Panhandle Eastern and the Cities Service put together in that field.

Mr. Littman: Perhaps if you were to tell us what you mean by the term "Canadian River Company", it might clarify the record.

[fol. 5705] Tell us whether you mean Canadian River and certain other subsidiaries that I have named.

The Witness: The Canadian River is the producing company for the Colorado Natural Gas Company.

Mr. Littman: Does it include the acreage of Consolidated Gas Company?

The Witness: No.

Mr. Littman: Or West Texas Gas Company?

The Witness: Yes.

Mr. Littman: It does?

The Witness: That is acreage held under the name of Canadian River and Red River and Southwest Development also falls in that class. That is all.

Mr. Culton: Mr. Littman, the Consolidated Gas Company is just a little company over in the east field that

has a very few wells which takes gas to Wichita, Kansas. It is not connected with Canadian River at all.

Mr. Littman: I see. The reason I have been using these names is simply because the Texas Railroad Commission refers to these as the nine major pipe line companies.

By Mr. Culton:

Q. For Mr. Lee's information, Mr. Hinton, I will ask [fol. 5706] if this is not correct, that the Canadian River Gas Company has the largest amount of acreage?

A. That is correct.

Q. And by the Canadian River Company you refer to Canadian River and its association companies, the West Texas Gas Company, the Red River Gas Company and Southwest Development Company and you do not undertake to say what the proportion is between those different companies?

A. I believe that the West Texas Gas Company should not be included in there as it is the transporting company and not a producing company.

Q. That is right. Now, the next in ownership of acreage, as you understand it, is the Texoma Natural Gas Company.

A. That is correct.

Q. And the next to that is the Cities Service Gas Company? A. That is correct.

Q. Next to that is Panhandle Eastern?

A. Panhandle Eastern.

Q. And next to that is Northern Natural?

A. Yes, and then there are 19 other small pipe lines running out of there.

Q. With only a few thousand acres each?

A. That has a total acreage which is equivalent to approximately Panhandle Eastern's or, as I remember, [fol. 5707] 74,000 acres, 10,000 more than we have, the other 19 companies.

Q. Now, the United Gas Company and the Lone Star Gas Company mentioned by the Railroad Commission in its report all operate only out of the east field?

A. That is right and I have never had the time to get the east field acreage and make a comparison, but I do have a map that shows the ownership in the east field colored showing the holdings of each company and I had that colored from records that are kept in the gas offices in Texas and referred to it from time to time.

Q. Now, you referred to the Hagy, Harrington & Marsh Company. It has a substantial gas acreage which is tied to the Northern Natural?

A. Yes, and it also has some acreage which is not yet developed.

Q. Then, in addition, there is the Phillips Petroleum Company, which is a large owner of various types of acreage in the field?

A. But, sells gas after it is stripped for gasoline to the Northern Natural Gas and does not transport gas from its holdings to any distant market.

Q. That is right, but if you consider major gas companies as meaning major producers of gas in the field and relating it both to sour gas and sweet gas, then the Phillips Petroleum Company is right up close to the top, is it not?

[fol. 5708] A. Yes, they would certainly fall in the class of major companies.

[fol. 5711] C. H. HINTON, a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Redirect Examination (Continued).

By Mr. Culton:

Q. Mr. Hinton, at our adjournment yesterday afternoon, we had just reached the Hugoton Field and we were preparing to talk a little bit about the gas situation in the States of Kansas, Oklahoma and Sherman and Hansford counties, Texas.

[fol. 5713] Q. Will you point out on Exhibit 26, using language that will be understandable in the record, the areas in Kansas in which Panhandle Eastern is now producing gas?

A. Panhandle Eastern now produces gas from the west half, in general, of Stevens County, the extreme east portion of Morton County and the south central portion of Grant County, with the addition of some wells held by gas purchase contracts which are located in the southwest portion of Haskell County.

By Mr. Culton:

Q. No. 26 is the rock-pressure map, No. 20 the company-ownership map as of June, 1941, and No. 44 is your [fol. 5714] future development map. Is that correct?

A. That is correct, I believe, other than that I don't recall you naming the data, the source of the data or the date of the tests on which Exhibit No. 26 is based.

Q. When was that? A. I think it is 1940.

By Mr. Culton:

Q. Now, do the colors on those three maps all have the same signification or are they of different meanings?

Q. They are of different meanings.

Q. Therefore, you can't use the color on one map in comparing the color on the other?

A. No, other than the undeveloped acreage shown on Exhibit 44 shown in the same color for the Panhandle acreage, as shown on Exhibit No. 20.

Q. That is a pink color, is it not?

A. That is a pink color.

Q. And by "undeveloped acreage", you mean acreage that will not be developed due to the period covered by your capital-expenditure study?

A. Yes, sir.

Q. The pink color on Exhibit No. 20 represents all of the company acreage at this time?

[fol. 5715] A. Yes. Also, all the acreage held under gas purchase contracts. It can be noted that there is a considerable group of acreage which is shown in yellow and red with a diagonal line running through each piece.

That acreage is owned 50 percent by the Panhandle Eastern Pipe Line Company and 50 percent by the Saturn Oil and Gas Company or the Southwest Oil and Gas Company.

Q. And gas purchased is in green, is it not?

A. Yes, sir.

Q. By that diagonal line that you speak of, that is where there is a 50-percent ownership by Panhandle Eastern and 50-percent ownership by these other companies?

A. Yes, sir.

Q. Now, will you point out on Exhibit No. 26 the first area which Panhandle Eastern developed in the Hugoton Field?

A. Yes. The first, or the discovery well, was drilled in Section 31 of Township 33, Range 37, Stevens County, Kansas, by W. L. Sidwell, and I believe that he was assisted in that by Mr. H. W. McNabb.

Q. When was that, do you recall? A: 1927.

Q. And Panhandle Eastern subsequently [acquire] some of that acreage?

A. Yes, after a considerable time spent in securing markets, Panhandle Eastern obtained a one-half interest [fol. 5716] in that well and has an ownership of one-half interest in that well at the present time.

Q. Was there some other acreage of that same classification at that time?

A. Yes, there were two general groups of acreage which were included in the contract known as the Argus contract, and they were not definitely outlined, but a list of acreage was furnished at that time to show which acreage should be dedicated to the supply required by the Argus Company.

Q. And is that block of acreage largely in the same general territory in the Hugoton Field?

A. Yes, sir, that is in the southern-southwest Stevens County.

Q. Does that area represent the area of the greatest activity on the part of Panhandle Eastern?

A. Not only Panhandle Eastern but other companies which are withdrawing gas from the Hugoton Field at this time.

Q. What other companies?

A. There are located in this general area 91 wells which are owned by the Republic Natural Gas Company.

Q. And where does it sell its gas?

A. To the Northern Natural Gas Company.

Q. All right.

A. And the wells owned by Panhandle Eastern, which supply the main line, and the wells owned by Panhandle

[fol. 5717] Eastern and jointly with the Stevens County Oil and Gas Company and the Southwest Kansas Oil and Gas Company, which furnish gas to the Argus Natural Gas Company.

Q. Where does the Argus market its gas?

A. Well, the principal market is Dodge City, Kansas. One of the big industrial markets is the sugar-beet plants located at Garden City, Kansas.

Q. Is that company connected with any other natural gas pipe line company?

A. Yes, that is a subsidiary company of the Northern Natural Gas Company.

Q. And during the period Panhandle Eastern has been taking gas from the area which you have just described, what has been the nature of the production, that is, has it been a heavy production or a light production?

A. No, sir, it has not been a heavy production. The withdrawal has yet to reach an average of 100 million cubic feet [a day] of gas per day, unless that happened the last six months of 1941.

Q. In other words, it has been area of low withdrawals from the beginning, is that correct, from an acreage standpoint?

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[fol. 5720] Q. Now, in your judgment, will the pressure declines resulting from production be felt further away in the Panhandle reservoir than in the Hugoton reservoir?

Mr. Littman: Just a minute. I object to that. I don't think this witness is qualified to answer that question.

By Mr. Culton:

Q. Well, is there any difference in the indicated permeability of the formation?

A. Yes, there is a decided difference.

Q. What effect does that difference have?

A. In order to answer that question, it would be necessary to compare the fields on the basis of the same rate of withdrawal.

Q. All right.

A. If we had the same rate of withdrawal in the Hugoton Field as we do in the Texas field, it would be necessary to have a great many more wells in the Hugoton

Field than would be necessary in the Panhandle Field of Texas, therefore, the development would be spread over a greater number of acres and the withdrawal would probably cover a much greater territory with reference to pressure decline.

Q. Will it take longer for the wells to build up in the Hugoton Field than in the Panhandle Field?

A. As an average, it takes a great deal longer for the Hugoton wells to build up than it does for the Panhandle wells to build up.

Q. Now, what do you mean by the words "build up"?

A. The term "build up" denotes the length of time that is required for a well to regain its official closed-in pressure.

Mr. Littman: Why is that the fact, Mr. Hinton? Do you mind if he explains that?

The Witness: That is due to the tightness of the formation and the low permeability which restricts the rate of flow in the Hugoton Field, whereas in the Texas field, why, [fol. 5722] there is higher permeability, especially in the Moore and Potter county portion of the field.

Mr. Littman: In other words, you mean that the permeability of the pay sands is greater in the Panhandle Field than in the Hugoton Field on the average?

The Witness: Yes, as so indicated by the build-up pressure data.

By Mr. Culton:

Q. You are referring to the fact that out of this Stevens County area, Panhandle Eastern has two markets, one, its market to the Argus Pipe Line Company furnishing gas for use for the Northern Natural subsidiary, and the other to Panhandle Eastern's main line. Where does Panhandle Eastern deliver the Argus gas?

A. At the wellhead.

Q. In other words, the Argus has its own pipe line and picks up the gas at the well?

A. When I say the "wellhead", I mean that it is a distance of some 50 to 70 feet from the wellhead as it is measured at that point and the exchange, of course, is made on the metered quantities.

Q. And how does Panhandle Eastern transport the gas which is used for its main line, that is, the gas which is produced in the Stevens County area which you have just described?

A. The major portion of the gas produced in the Stevens County area travels in almost a due easterly course from a point in the gathering system, which is about four miles west of the southwest corner of the Town of Hugoton, Kansas.

Q. Does the Panhandle Eastern own all of its gathering system there? A. Yes, sir, it does.

But there is, also, at certain times an amount of gas that travels up through a 10-inch line which commences in Section 24, Township 33, Range 39 and is laid in a northeasterly direction to a point in Section 4, Township 33, Range 37, both in Stevens County, and thence in an easterly direction through a looped 12-inch line over to a point in Section 4, Township 31, Range 36, where the looped 12-inch line changes in size to a single 16-inch line.

It then travels up to a point in the northwest quarter of Section 28, Township 30, Range 34, located in Haskell County and at that point it is connected to an 18-inch line which goes in a southeasterly direction down to the Liberal compressor station.

Q. In other words, Panhandle Eastern has a block of acreage there in Stevens County, Kansas, as shown on Exhibit No. 20, and a considerable portion of that has been developed by the drilling of wells. Is that correct?

A. That is correct.

[fol. 572.] Q. And part of the gas from those wells goes in an easterly direction and ties into the main line at Liberal?

A. It goes into the intake side of the Liberal compressor station.

Q. And the rest of the gas goes in a northeasterly direction and makes a connection with another gathering line of Panhandle Eastern's and then goes in a southeasterly direction to Liberal. Is that correct?

A. That is right. The 18-inch line was built to take care of the production which has been developed in the

Grant County portion of our acreage and, also, takes care of two gas purchase wells which are located in the extreme western edge of Haskell County.

The system is an entirely looped system, that is, it is possible for gas produced in the north part of the field to travel around by the way of Hugoton, or gas produced in the Stevens County area of the field to travel clear around, as was described.

Q. Does that constitute an additional guarantee of service in the event one of the lines goes out?

A. Yes, it does. It also has some impractical features from an operating standpoint.

Q. What are those?

A. In the winter time as the higher pressures are required to supply our market requirements at the proper [fol. 5725] intake pressures at Liberal, the pressure out on this small line is raised to the point where the gas will freeze. There is very little flow and in the winter time we often close one gate on that line which could be opened in case of line failure, but we govern the flow by closing a gate valve there.

That is on the 10-inch line located in the northwestern part of Stevens County.

Q. Was the upper gathering line constructed at the same time the lower gathering line was constructed?

A. No, sir, the lower gathering line was constructed in the latter part of 1930 or the first part of 1931 and the 18-inch portion of the system was constructed in the latter part of 1937.

Q. And was that the time that Panhandle Eastern opened up its production in the Grant County area?

A. Yes. We took no production from Grant County until the latter part of 1937.

[fol. 5726] Q. Does Panhandle Eastern have any competitive production out of that area in Grant County?

A. Yes, there are three markets out of that area, namely, the Tri-County Gas Company and the Peerless Carbon Black Company and the United Carbon Company.

Q. What use do the carbon companies make of their gas?

A. Why, the carbon companies make what they term an extremely high grade of carbon black.

Q. For printers ink and things of that kind? A. Yes.

Q. And is there another pipe-line company operating out of there?

A. Yes, that is the Tri-County and it produces gas that serves portions of the extreme eastern side of Colorado and some extreme western Kansas towns and, also, produces some gas for the Northern Natural Gas Company.

Q. Is it, so far as you know, affiliated in any way with any of the other gas companies?

A. No, sir, I do not know what the background of that company is.

Q. Now, what about the present situation from a gross-production standpoint as to acreage in the north of that lowered pressure area in Grant County?

A. That is yet to be determined. It is assumed that [fol. 5727] it will be, in general, the same as that which has been developed in Grant County to date, but the variation in the wells which have been drilled in Grant County to date indicates that there will be some very good spots and some very lean spots in that area.

Q. Is there any other pipe line operating in the area north of that which you have been describing, north of the lowered-pressure area in Grant County?

A. Yes. There is production in that area from some Tri-County wells and from some wells which are owned by the Northern Natural Gas Company.

Q. Now, with respect to the area in Stevens and Seward counties, which lies immediately east of the area from which Panhandle Eastern has taken the greater portion of its production, what is the production situation in that area?

A. You refer to the low-pressure area—

Q. (Interposing) Well, everything from the lowered pressure area in which Panhandle Eastern has produced gas, going easterly?

A. There has been only slight development in the area to the east. The discovery well of the entire field, not the Hugoton Area, was encountered on the Bole Farm in 1924, I believe.

Q. Where is that located on the map?

A. That is about four miles to the west of the Town of [fol. 5728] Liberal, Kansas.

Q. All right.

A. And between the eastern development of the Hugoton area and the development shown just west of Liberal there on Exhibit 26; where the lower pressure area appears there have been no wells drilled. There was a well drilled immediately north of Liberal here in Section 29, Township 33, Range 33, Seward County. That well is known as the Seeley wells and at the present time has an open flow which is below 750 thousand cubic feet per day. It has never been connected to any market.

Q. Would you consider such a well as that really a commercial well?

A. With acid treatment, I think it is quite possible that it can be made into a commercial well, as there are many wells in Grant County, in the portion of the field which has been developed in Grant County, that have had natural open flows that have been less than one million cubic feet per 24 hours.

Mr. Littman: How did they respond to the acid treatment?

The Witness: Very good.

Mr. Littman: What open flow was secured after the acid treatment?

The Witness: Well, when we speak of open flow on an acidized well, it is necessary to name the type of open flow method used in testing.

[fol. 5729] Mr. Littman: Well, I am referring to the same method by which you arrived at the one million figure that you just mentioned.

The Witness: By the same method the test of some of those wells will go up to 16 million [to] 17 million. In fact, we had one well which had a natural open flow of slightly

under one million cubic feet and when acidized it went to 28 million cubic feet per day.

Most of the wells in the Hugoton Field respond to acid treatment better than the wells in the Panhandle Field when the tests are made by the pitot tube method, but when those wells are back-pressured, they do not show any greater increase than the Panhandle wells.

In other words, a well will have a natural open flow of one or two million cubic feet and when acidized will go up to 20 million or more.

When tested by the back-pressure method, the open flow on those wells will usually be about 4 to 5 million greater than the natural. In other words, they fall into the 6 million or 7 million classification.

Mr. Littman: And then they are commercial wells?

The Witness: Oh, yes; yes, sir.

By Mr. Culton:

[fol. 5730] Q. Now, you referred to the well on the Boles Farm down there by Liberal. What company has been taking gas from that well?

A. The Liberal Gas Company.

Q. Then, there is an area north of the Boles well and, also, south of the Boles well several miles in extent, from which no production has been taken?

A. Yes, sir. The total development of the Kansas portion of the Hugoton Field is about 11 percent of the acres [fol. 5731] outlined on this map.

Q. Now, tell us the production situation with respect to the wells in Texas County, Oklahoma. What production has been taken from that area?

A. The total amount of production that has been taken from Texas County, Oklahoma, has been very light indeed. The principal markets for wells drilled in Texas County are the Cimarron Utilities Company which furnishes gas to some of the small towns in Oklahoma, the Guymon Gas Company and the Cabot Carbon Company.

Q. The Cabot production is used for what purpose?

A. For the manufacture of carbon black.

Q. Has the manufacture of carbon black proceeded in the Hugoton Field anything like the extent that it has proceeded in the Panhandle Field?

A. No, and I don't think that it ever will.

Q. Why not?

A. Because there is not enough gas there to supply the same quantity that is supplied in Texas without building very extensive gathering systems.

Q. In other words, the wells will not deliver anything like the same volumes of gas? A. No, sir.

[fol. 5732] Q. Now, what other companies, if any, other than those small companies which are now producing gas from the Texas County, Oklahoma, area?

A. Yes, the Republic Natural Gas Company has, as I remember, 23 wells now connected in the northern portion of Texas County, Oklahoma, and that gas is sold to the Northern Natural Gas Company.

Q. The Northern Natural goes to Minneapolis and St. Paul? A. Yes, sir.

Q. And, also, serves other points in between?

A. That is right. The Omaha District of Nebraska, and that contract has clauses which concern the Omaha and vicinity market.

Q. Now, has the Republic acreage in Texas County, Oklahoma, been producing very long?

A. They have had some wells down there for, I believe, [fol. 5733] six or seven years. However, they have drilled some 20 wells down in that area during the past three years.

Q. That area in Texas County, Oklahoma, about which you have been talking is really a portion of the same general area as the Stevens County area which you first discussed, is it not?

A. Yes. If we had no knowledge of a state line existing there, we would not know when we crossed from one State to the other.

[fol. 5734] Q. And that is just part of the same general pressure area and the same production area?

A. That is correct.

Q. Now, passing below that portion of the Texas County, Oklahoma, area, which is really a part of the Stevens County area, what has been the production situation to the south?

A. You refer to the central part of Texas County, Oklahoma?

Q. Central southern part.

A. In the central part the withdrawal has been extremely light and the only reduction in pressure shown is that the decline has been below 430 and the pressures are still above 420.

Q. Where is that point located?

A. Referring to Exhibit 26, it crosses the "X" in Texas County, Oklahoma, which is located about four miles north of the Town of Guymon, Oklahoma.

[fol. 5735] Q. That is the small, orange-colored portion?

A. Yes, the only portion of Hugoton Field outside of the extension of the Kansas development at the northern edge of Texas County, Oklahoma, that shows any pressure decline at this time.

Q. Is there a development in the southern part of Texas County, Oklahoma?

A. No extensive development. There have been some wells drilled and I don't have the locations. It is just a matter of a very few wells.

Q. What is the production situation with respect to the acreage of Hansford and Sherman counties, Texas, that is thought to be a part of the Hugoton Field?

A. There have been wells drilled in Hansford and Sherman counties which govern the outline of the dotted line shown on Exhibit 26. The best wells were drilled in Sherman County by the I. T. I. O. Company and Hagy, Harrington & Marsh, and they were wells of considerable size. As I remember they had natural open flows of some 40 million cubic feet for 24 hours.

[fol. 5736] Trial Examiner: They were not used?

The Witness: They have never been connected to any market yet.

Trial Examiner: What happened to them?

The Witness: They are there, ready to be connected.

Trial Examiner: Simply closed off, finished but closed?

The Witness: Yes, sir, that is true.

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Mr. Littman: According to Dr. Bartle, the Hugoton Field, as outlined by him on Exhibit 26, designated by the area within the dotted lines covers an area of 2,540,000 acres.

[fol. 5737] Now, can you state how much of this territory is under lease by all companies at the present time?

The Witness: No, sir.

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The Witness: No, sir, because there is so much of that marginal acreage that is not leased and probably will never be leased that I could not say. I can say this, that I would estimate that 90 percent of the acreage lying within a distance of some two or three miles from the outer limits of development is now under lease; but bringing in the marginal acreage in the Hugoton Field, the same as any gas field of this type, there will be many thousands of acres of marginal acreage, I mean the acreage located near the extreme outer edge of the field, that will in all probability never be leased.

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[fol. 5738] Mr. Littman: Well, would you say that approximately a half of this amount of acreage embraced by the outline of the Hugoton Field shown in Exhibit 26 is under lease, roughly?

The Witness: Roughly, I would say yes.

Mr. Littman: And about a half, of course, is not under lease?

The Witness: That is correct. I am doubtful whether it will be leased until such time as development proves that there may be sweet spots or areas of better produc-

tricity lying closer to the boundary of the field shown on Exhibit 26.

Mr. Lüttman: Now, while we are on this subject, at this point, am I correct in understanding that Panhandle Eastern at the present time controls approximately 10 percent of the acreage embraced in Dr. Bartle's outline of the field, to-wit, 245,282 acres?

The Witness: Yes, I would say that the Panhandle Eastern Pipe Line Company controls approximately 10 percent of the areas included in the outline of the field shown on Exhibit 26, if the calculations of 2½ million are correct.

[fol. 5742] By Mr. Culton:

Q. I believe you have testified that the Cities Service Gas Company, or the Empire organization owns substantial reserves in the Hugoton Field which have not yet been developed at all. Where are those reserves located?

A. Well, they are located in Township 3, Range 13, portions of each Township mentioned; Township 3, Range [fol. 5743] 14, and Township 2, Range 13 and Township 2, Range 14 and take in portions, also, of Township 1, Range 13 and Township 1, Range 14, all in Texas County, Oklahoma. That is known as the Stonebreaker Ranch.

Q. And in solid blocks, practically?

A. Practically in solid block, except for acreage held at the north edge. It is not adjacent to and contiguous with the Stonebreaker Ranch, but still it is checkerboarded in close to that general area.

Q. Do you know if the Cities Service, also, owns leases in the Texas portion of the field through the I. T. I. O.?

A. Well, I don't believe that the I. T. I. O. is in existence any more. I think it is just straight Cities Service Gas Company at this time. They do hold acreage in the Sherman County portion of the State of Texas portion of the Hugoton Field.

Q. And their former affiliate or subsidiary, the I. T. I. O., was the company which you testified had done some discovery drilling in that area?

A. Yes, that is correct.

Q. Now, is there any other company which holds substantial portions of undrilled acreage in the field?

A. Yes. The Northern Natural Gas Company has considerable holdings.

They have considerable acreage in the central part of Stevens County and the greater part of it being located up in the Grant County, central Grant and central Stevens counties.

Q. How about the Republic Natural Gas Company? Does it have a substantial amount of undrilled acreage?

A. Yes, the Republic Natural Gas Company, for the size market it has, carries more acreage by delay rentals than any company I have ever known.

Q. Where is its acreage located?

A. Its acreage is located in both Texas County, Oklahoma, Stevens County, Kansas, and some, I believe, is in the southern part of Grant County, Kansas.

Mr. Littman: Mr. Culton, from time to time the witness has referred to substantial acreage. Can he supply the figures for us?

By Mr. Culton:

[fol. 5745] Q. Can you give us a rough estimate now, recognizing the fact that it would be only rough? For instance, the acreage held by Republic?

A. Republic at the present time holds approximately 220,000 acres located in the Tri-State field. That is subject to check, because the acreage picture changes so fast. They have acquired a great deal of acreage during the past year. They have taken over the acreage which was formerly held by Hagy, Harrington & Marsh in the Kansas portion of the Tri-State Hugoton Field and have, also, acquired considerable quantities of acreage in Texas County, Oklahoma, both by leasing scattered blocks and by exchanging acreage with other companies.

Q. Now, Hagy, Harrington & Marsh sold all of their Kansas acreage, you say, to Phillips. Do you know how much was left for them in Texas County, Oklahoma, and

Sherman and Hansford counties in Texas, including the Bivins Cold Water Ranch?

A. Before they got the Bivins Cold Water Ranch, as I remember, they had 54,000 acres and the ranch in total is some 40,000 to 45,000 acres.

Mr. Littman: What is the total of that?

The Witness: 90,000 approximately.

By Mr. Culton:

Q. Can you give us the approximation of the Northern [fol. 5746] Natural acreage?

A. No, because their acreage picture changed just during the past few months and I don't remember what it is, but it is in excess, I am quite sure, of 100,000 acres.

Q. And the Cities Service?

A. I don't know what the acreage in the Stonebreaker Ranch is, but it can't help but be around 100,000 acres.

Q. Is there any other company with very large acreage except those that we have mentioned?

A. Well, the Peerless Carbon Company have a great deal of scattered acreage and considerable quantities of acreage are held by the Columbian Fuel Corporation. When I say, "considerable", I mean around 15,000 acres.

I would say there is considerable acreage.

Mr. Littman: There isn't any question about the fact that Panhandle Eastern is, by far, the largest individual holder of acreage in the Hugoton Field?

The Witness: I believe that is right. I had a figure in my mind the other night that Republic had acquired a greater number of acres than we held, but since I have been thinking it over, I am quite sure that I was wrong and I was thinking on the basis of the number of acres in proportion to the market rather than in total.

By Mr. Culton:

Q. The Republic is next to the Panhandle Eastern in [fol. 5747] acreage?

A. Yes, I am quite sure it is.

Trial Examiner: So far as Panhandle is concerned, that statement refers to acreage under purchase contracts, or only to royalty acreage?

The Witness: That includes both the acreage held by development and delay rentals.

By Mr. Culton:

Q. In other words, in addition to the acreage owned by Panhandle Eastern in that field, Panhandle Eastern is connected to a substantial gas purchase?

A. Yes. We buy gas from more wells in the Hugoton Field than any other company except the Northern Natural Gas Company, which buys from Republic and the Kuhn Brothers, also, the Derby Trees Oil Company and are interconnected with wells owned by the Tri-County Gas Company, these wells being able to produce into the system of the Tri-County Gas Company or the Northern Natural Gas Company.

Q. From the standpoint of Panhandle Eastern Pipe Line Company, what is the necessity for owning this undrilled acreage?

A. As a matter of reserve and having a place to carry on future development that will enable the company to supply its market requirements.

Q. Being in control of the acreage, does that permit [fol. 5748] you more safety to plan in the future with respect to your gathering lines on a general program of development that if you just had to connect to such operators as desired, to sell?

A. Yes. It does help us with our development planning, but at the same time, this same thing applies in the Hugoton Field, maybe not to as great a degree, but it does apply, that withdrawal is the index to the total recovery from either of these fields. If we are subjected to a heavy rate of withdrawal which is contiguous or adjoining our acreage, why, then the amount of gas which we will recover will either be decreased or we will have to take it at a greater rate.

Q. Owning and controlling the acreage yourself permits you to more economically operate your gathering lines and determine pressures at which they will be operated, and things of that kind?

A. When you say "owning acreage", you mean that the acreage is only held by royalty?

Q. That is right.

A. As we own no land in fee at all.

Q. That is right. I mean, you own and control your leases. A. Yes.

Q. Giving you the right to operate your leases?

A. That is right. It does give us a much better opportunity to plan from an operating standpoint.

[fol. 5749] Q. In other words, it gives greater elasticity to the system so that you can control the expansion at such time as you think it most economical to spend?

A. Yes, that is right.

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[fol. 5752] Q. The acreage which Panhandle Eastern now holds in that field is held largely as a matter of protection for the future, is it not, so as to give adequate reserves in the future?

A. You refer to the Hugoton?

Q. Yes.

A. Yes, that is correct. We have always thought of the Hugoton Field as the source of our future reserves.

Q. It furnishes insurance to Panhandle Eastern and its customers and the people served by it of a supply of gas as long as that field reasonably lasts?

A. That is correct.

Q. Is Panhandle Eastern's acreage confined to one particular portion of that field, or is it pretty well distributed over the entire field?

A. It is very well distributed over the entire central portion of the field.

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Q. And a comparison of the acreage picture on Exhibit 20 with the general field outline on Exhibit 26 will show that Panhandle's acreage is well distributed over the entire field so as to take advantage of any situations which may arise in [difference] portions of the field?

A. That is correct and, also, it would, in my opinion, not be good policy to put all your eggs in one basket, take all the acres in one portion of the field when the

percent of the field that has been developed is as low as it is at the present time.

[fol. 5754] By Mr. Culton:

Q. Mr. Hinton, at the recess, you reminded me that the Panhandle Eastern had acquired substantial acreage in the last few months. A. Yes.

Q. About how much acreage has been recently acquired in the Hugoton Field?

A. Yesterday, in answer to Mr. Lee's inquiry, I read into the record the amount of acreage which was now held by Panhandle Eastern as of November 30, 1941. In last night's mail, I got my acreage report for the next month and, if you would like, I can read that total in, as of December 31, 1941.

Q. All right.

A. 256,962.69 acres. That shows a total increase of somewhere around 29,000 acres, and I cannot be sure because I do not know just exactly what it was as of June 30, but, in round numbers, we would say 30,000 acres.

The greater amount of the acreage which has been leased during the period mentioned is located along the north side of our present development in Grant County, Kansas; also, some to the west and to the south of our present pipe line, which extends in a diagonal line across the Grant County map, as shown on Exhibit 20.

We have also secured additional acreage in a portion of Texas County, Oklahoma, which is principally located in [fol. 5755] Township 5, Range 13; Township 5, Range 14, and Township 4, Range 14, all in Texas County, Oklahoma.

Q. Does that help to block in the company's acreage in those two areas?

A. Yes, it does. It gives us a very nice area to develop in Texas County, Oklahoma, and that area is in very nice relationship, as to location, to our proposed gathering system and the acreage which has been secured in Grant County, Kansas, is located so that it may be connected to our present system without incurring great costs for additional pipe lines.

Q. In your original testimony, you assumed that Panhandle Eastern would, so long as it is economically ad-

visible, apportion its takes between the Panhandle Field and the Hugoton Field on approximately the present basis. What is that present basis of apportionment?

A. It is, in percent, around 27-1/2 percent from the Hugoton Field and about 72-1/2 percent from the Panhandle Field of Texas.

Q. What principles have guided you in selecting that present apportionment?

A. The total rate of withdrawal from each field and the protection of reserve to the greatest possible extent in each field.

Q. What do you mean by "protection of reserves"?

A. By that, I mean that our rate of withdrawal from [fol. 5756] each field is governed by the total withdrawal from each field and, more particularly, around the areas in which we operate.

Q. In other words, you have reached the conclusion that as long as the present production from the two fields is approximately what it now is, that you will be able to protect your reserves in both fields from extraordinary drainage by apportioning on that basis?

A. That is correct, and it must be given much consideration in the problem of obtaining the greatest possible amounts of gas from our reserves, especially in this type of field.

Q. Which field do you refer to, when you say, "this type of field", both?

A. Both fields, but more particularly in the Texas fields where the rate of flow through the formation is greater.

Q. You also stated in your original testimony that you assumed that the Panhandle Eastern would continue to apportion its production between its own leaseholds and its gas purchase contract acreage on the basis now existing? A. That is correct.

Q. What is that basis?

A. That concerns the method of proration used by this company in each field.

Q. And what elements are taken into consideration, in that proration?

[fol. 5757] A. The proration formula used in the allocation allowables to wells located in the Panhandle Field is 50 percent of the total production divided on the basis

of the total acreage and 50 percent of the total production divided on the basis of total open flow and the percent which each well participates in the total development, governs the percent participation which that well will have in the total withdrawal by this company.

Q. What is Panhandle Eastern's practice with respect to the acreage which will be considered in connection with any well from which it takes gas? Do you have a maximum acreage?

A. Yes, there is a maximum acreage unit of 640 acres per well.

If you meant for me to also describe the method in the Hugoton Field, I did not complete that.

Q. Yes.

A. In the Hugoton Field, the formula used by Panhandle Eastern Pipe Line Company is that of determining allowables by dividing the total market into two parts, one part being 75 percent, which part is divided on the basis of acreage times wellhead pressure; the other 25 percent is divided on the basis of open flow and, of course, the same applies as in the Texas Field, that is, that the percent that each well participates in the total development governs the percent which that well will participate in the total market.

[fol. 5758] Q. How long has Panhandle Eastern adopted the practice of using 640 acres as a drilling unit?

A. We have never used a unit greater than 640 acres in proration during the entire history of the company.

Q. I think you said something about your plan, at least for sometime in the future to meet peak requirements from the Hugoton Field. Just what did you mean by that?

A. If we would design our lines so that we would meet our peak requirements by applying the percent of division between fields, it would mean that we would have to make many thousands of dollars of capital expenditure for increasing the capacity from Texas.

Therefore, the load has to be handled in such a manner that the ~~monthly~~ divisions have the tendency of curtailing Hugoton production during the summer months when the load demand is light and then taking far more than the 27½ percent during the four winter months.

Q. In other words, what you have in mind, as nearly as possible, is keeping the Panhandle area on a fairly constant load factor?

A. Yes, that is right. In other words, during the summer months, the percent of the total market from the Panhandle Field exceeds the percent which we set for that field of 72-1/2 percent.

In fact, it will run up into the high eighty percents [fol. 5759] during the low-pull months in order to meet the percentages which I believe will be most advantageous for the company acreage.

Q. You have testified that commencing in 1942, you expect to have a substantial program of expansion of your facilities in the Hugoton Field by reason of operations in Texas County, Oklahoma.

Will those operations in that field result in any immediate change in the volumes of gas taken from the Panhandle Field?

A. No, sir, but they will result in some curtailment of take from the developed portion in the Kansas Field.

Q. I believe you stated that, from the standpoint of physical operation, you could, for a while, continue to take the necessary volumes of gas from the existing producing properties in the Hugoton Field?

A. That is correct. We have been forced into the development program which we expect to carry out during 1942.

Q. That is due to the circumstance that you had some expiring leases in Texas County, Oklahoma, which were top-leased by other operators?

A. Yes, and it so happens that those leases are located in what should be a very nice part of the Texas County portion of the Hugoton Field.

Q. Would you be able to protect yourself merely by the [fol. 5760] drilling of wells on those leases which are expiring?

A. The lease form requires that a developed lease be producing gas in commercial quantities.

Q. And the mere discovery of gas is not sufficient to hold your lease?

A. Just the drilling-in of a well does not completely develop a lease.

Q. You have already, I believe, started, and are down about the producing horizon, the first well in that field to be drilled under that plan? A. Yes.

Q. And will you point out on Exhibit 44 the location of that well?

A. That well is located in the—it is shown here to be located in the west half of Section 25, Township 3, Range 15, but we have shifted the location of that well over to the center of the north half of that section so that we will have another location on that lease which consists of 800 acres that will be a greater distance from the well than it would be if we would have gone ahead and drilled in the center of the west half of that section.

[fol. 5761] A. Yes.

Q. Now, do you have any other leases in that field which have been top-leased and which would have to be drilled pretty soon if they were held?

A. Yes. Of the wells shown in brown which indicate the development which will be carried on during the year 1942, there are 20 wells shown and of this 20, 14 have been top-leased.

Q. Now, you have stated that it would not be enough to hold the leases merely to drill the wells. How far are those wells located from the present trunk line, roughly speaking?

A. About 12 to 15 miles average, I would say.

Q. Is there any existing gathering line which could serve those wells?

A. No, there are no existing gathering lines.

Q. In the construction of the gathering line system shown on Exhibit 44 in brown, have you limited that gathering line to a size sufficient to serve the wells which you expect to drill during 1942? A. No, we have not.

Q. Why is that true?

A. Because we are looking at the over-all cost of a development required to carry the amount of gas which we anticipate taking from this portion of the Hugoton Field. [fol. 5762] and if we would build a line that would take care of the production of the wells drilled in 1942, it would

mean that that line would have to be looped or the capacity increased by building an additional line in the next year or two, and it is much cheaper to provide for future capacity by the looping of one line of larger diameter than it is to build several lines of smaller diameter pipe.

Q. Therefore, in your construction program, you have taken into consideration the over-all economic picture of the company now and in the future, is that correct?

A. That is correct. However, the present 22-inch line will probably not be adequate to carry the total amounts of gas which we will have to take from this field in future years.

Q. That is, after the 1946 period?

A. Yes. I think it will be quite a while before we have to loop this line, but then the 16-inch line which carried the gas from the Hugoton Field at the time it was built was of large enough diameter to carry the gas to fulfill market requirements.

We have now built the 18-inch line, known as the Grant County, 18-inch Line, and sometime after 1946, and probably not too long after that, it is going to be necessary to further increase the capacity of the pipe line from Hugoton Field.

Q. After the Texas County, Oklahoma, gathering line is completed, then you will have three major gathering line [fol. 5763] systems in the Hugoton Field. Is that correct?

A. That is correct.

Q. Two in Kansas and one in Oklahoma?

A. Yes, sir, that is correct.

Q. You will still have none in Texas?

A. Maybe for clarification, we would say, instead of two major gathering systems, we would say that we have two major trunk lines connecting to our gathering system in that field.

Q. That is right, but you have one gathering line serving the Texas County, Oklahoma, area, another serving the Stevens County, Kansas, and another the Grant County, Kansas, with a connection from the one serving the Grant County, Kansas, to the one serving the one serving the Stevens County, Kansas?

A. Yes, that is correct.

Q. You do not, during this five-year period, expect to develop any of the acreage held in Hansford County, Hansford or Sherman counties?

A. No, that acreage is held for the purpose of trying to make up what we will not be able to produce from the Panhandle Field, and thus longer utilize the facilities which will be installed and are now installed at the Hansford compressor station.

Q. In other words, after the time arrives when it will [fol. 5764] become necessary for Panhandle Eastern to cease producing gas in the Panhandle Field, you expect it to develop its properties in Hansford and Sherman counties, Texas, so as to use as much of the trunk gathering line which now extends down into the Panhandle Field as is possible?

A. That is correct, and also the compressor station facilities.

Q. At Hansford? A. At Hansford.

Q. In other words, you assume that you will probably have a gathering line running from Sherman and Hansford counties into the Hansford station?

A. Yes. I have projected that and tried to relate it into the problem as a whole on a ten-year plan, and that line shows it is to be built in that ten-year period.

Q. You have, I believe, referred to the circumstance that efforts are now being made, and have been made for some time, to enforce statutory proration in Kansas?

A. That is right.

Q. And have stated that if that movement succeeds, there is a probability that it will increase Panhandle Eastern's capital expenditures over those shown in your exhibit?

A. If the same type of order is placed on the field or, I would say, the same order that is now, I believe your attorneys call it "stayed", then I think that it will be necessary [fol. 5765] to make additional capital expenditures in that field over those which we show, and that the cost of gas may also be increased by the fact that the unconnected wells may be connected to our line by an order of law.

Q. Is that due to the circumstance that you will probably be permitted to produce less gas from individual wells than you can produce now, thus requiring you to

take your entire requirements from a greater number of wells?

A. Well, that is largely dependent, as the system exists today, upon the Republic Natural Gas Company and the State of Oklahoma.

Q. Will you explain that?

A. Republic Natural Gas Company has been facing this order the same as all companies operating in the Kansas portion of the Hugoton Field, and it looked to them as though they might be forced to operate under such an order.

In order to meet their market requirements and to be able to supply their contractual amount for the Northern Natural Gas Company, it would have been necessary for them to have drilled a number of wells in the Hugoton Field in the neighborhood of 50 additional wells but, in place of doing that, they merely went across the State line into Oklahoma and drilled about 20 wells, from which they are able to take a great amount of gas.

If the State of Oklahoma would come out with a pro-[fol. 5766] ration order, why, that would, maybe help to protect us somewhat, but if it does not, Republic Natural [Gas] Company, by drilling just a few additional wells, can take the major part of their entire demand from the State of Oklahoma and cut down on the amounts which they will take from the Kansas wells, and that will set the pattern for Panhandle Eastern and it will mean—

Q. (Interposing) By "setting the pattern", you mean the amount of production per well?

A. I mean the amount of gas that can be produced for each M.c.f. open flow and each acre-pound which, when developed, will be necessarily the same as that taken by the Republic Natural Gas Company or by any market that sets the pattern, and by setting the pattern, I mean the company that has the lowest ratio between their market demand and development.

Q. And in the event that caused the pattern to change and lowered the amount of production per well, how would you obtain your additional production?

A. By drilling additional wells or by moving to Oklahoma, unless we had a proration order in Oklahoma. If

we had no order in Oklahoma, it would mean that we would certainly develop in that State rather than to drill wells where the amounts of gas which would be taken would be lower than would be good for economical operation.

[fol. 5767] Q. Mr. Hinton, in the event your present plan is fully carried out, you will drill these wells you have referred to in Texas County, Oklahoma, and are permitted to prorate among all your wells in the Hugoton Field on your present basis, would your production have a tendency to cause the pressures of the field to go down more uniformly than if all of the production were being taken from one individual area?

A. No. As long as we have the two-state situation there any proration order.

Q. (Interposing). I mean, disregarding proration, if you are permitted to go ahead and use your own judgment of prorating among the wells, would the pressure go down more uniformly over the field, as a whole, than if you were taking your production from, say, Stevens County?

A. It would certainly be more uniform. Anytime the rate of production is properly distributed, the decline in pressure will be more uniform over the field.

Q. What effect does decline in pressure have on the deliverability of gas from wells and the ability to carry uniform pressures in gathering lines, and so forth?

A. It creates a much better operating condition, because a common pressure will be experienced at almost all wells, and by lowering the working pressure down to a certain point, it would still mean that all wells will be [fol. 5768] able to produce gas into the system, whereas if the wellhead pressures are not uniform, such as those we have in the Panhandle Field in Texas at this time, why, it is then necessary to revise and revamp the gathering system by the addition of horsepower in the low-pressure areas.

Q. I believe that you have testified that you have in mind taking a maximum of approximately 60 billion per [fol. 5769] year from the Texas Field. Is that correct, 60 billion or 61 billion, something like that?

A. Yes, as long as I have estimated that we would be able to take that amount.

Q. And I think in response to questions asked by Commission counsel, you stated that, of course, by addition of capital expenditures, you could take, for a while, greater amounts than that from the Panhandle Field?

A. That is right.

Q. Why is it not economical, in your judgment, to do that?

A. Because, if we spent all of our money for capital expenditures in Texas, it would mean that at the time when we would move from Texas to the Hugoton Field as a source of production, that our over-all money picture of capital expenditures would be much greater than it would be if we carry out the development plan which we have outlined.

[fol. 5777] Mr. Littman: (Interposing) May I interrupt to inquire whether you mean by that if the capital expenditures, which are shown in Exhibit 42 for the years through 1946, are made to some extent in advance and in anticipation of future needs, is that what you mean?

The Witness: Yes, and at the same time to cut down on the amounts that will be required in years after that period.

By Mr. Culton:

Q. In other words, in determining your expenditures during the period 1941 to 1946, you had in mind taking care of some of the situations which would develop during the years 1946 to 1951?

A. Yes, it would not be wise planning not to do so.

Q. And in some instances, possibly later than that?

A. Yes, that is correct.

Q. Do you think that all of these expenditures which you have shown in Exhibit 43, Schedule 1, being a list of additional capital expenditures required to produce and [fol. 5778] gather basic load during the years 1941 to 1946, will be required?

A. Yes, unless, of course, we are forced to cut back some of our load due to the fact that we will not be able to obtain the necessary steel to make these additions.

Q. Aside from the possibility of getting the steel, and looking at it from the standpoint of the company's economics, do you think it is advisable for all those expenditures to be made, for the most economic production of gas?

A. Yes, and I might say that the major items are now on order.

Q. That is to obtain the basic load. Do you think that these items separately set out in Exhibit 42 under the basic load are priced at reasonable prices for such labor and materials?

A. Well, reasonable, but I think perhaps that we should not mention the uncertainty of labor prices, because they are not reflected in those prices, and what now appears to be a reasonable price may become an unreasonable price with the rising conditions.

Q. But the prices, you think, are fair and reasonable as of the time the exhibit was prepared?

A. Yes, sir.

Q. But you refer to the present reasonableness of those prices. Do you mean there will be increases of those, [fol. 5779] prices or decreases of those prices?

A. We know prices are increasing on practically everything at this time, and I think our last pipe prices show that carload lots of pipe are increasing on a tonnage basis, and we did not use carload lots of pipe in the pipe to be used for the major portion of the gathering system.

Q. Do you think that the items shown in Schedule 2 of Exhibit 43, being additional capital expenditures required to produce and gather anticipated increased loads, will be reasonably required in order economically to handle the increased loads under Mr. Morton's estimate?

A. Yes, I think they are quite reasonable.

Q. Do you think that the prices shown for those items in Exhibit 42 represent fair and reasonable prices for those items as of the date of that exhibit was prepared?

A. I think the prices used are as nearly correct as it would be possible to place a price upon that type of work and equipment.

Mr. Littman: As of what date?

The Witness: As of June 30.

Mr. Littman: 1941?

The Witness: 1941.

By Mr. Culton:

Q. And if you were revaluing those various items at this time, or determining the present cost, would the cost be higher or lower than the cost shown at the present [fol. 5780] time?

Trial Examiner: I think the record at the present moment is the witness has given no effect to the price increases or the causes for the price increases since the computation was made as of June 30, 1941.

Mr. Culton: The statement of the Examiner is correct, is it, Mr. Hinton?

The Witness: That is correct, or that is what I attempted to convey, at least.

[fol. 5782] Q. Mr. Hinton, in your original testimony on Page 33 of Exhibit 42, you made this statement:

"Panhandle Eastern will, in the future, be required to increase its operation and maintenance expenses, even to produce the same volumes of gas which [which] it now produces."

On Page 729 of the record, in response to a suggestion from the Examiner that it would be appropriate for me to explain why we were offering evidence as to the cost of future capital expenditures during the next five-year [fol. 5783] period, I made this statement:

"Another circumstance which makes this evidence very pertinent is that as the years go by the evidence will show the over-all unit cost of producing gas is increased. It is increased because of the necessary carrying charges on the additional capital expenditures which will be required and increased by the necessary amortization of those capital expenditures and the depreciation of the items, and increased by the additional operating expenses which would be necessitated by reason of the increased expenditures."

In your Schedules presented in connection with Exhibit 42, that is, Schedules 3 and 4, in which you estimate operation and maintenance expense, both on the basic load and on the anticipated load, did you include anything as representing depreciation for any of the company's property?

A. No, sir, depreciation was not included. Schedules 3 and 4 refer only to operating and maintenance costs.

Q. By that you mean actual out-of-pocket money?

A. Yes, out-of-pocket money with the exception of the power item which has been brought up, which is an accounting problem.

Q. Yes. Then your schedules do not reflect anything for amortization? A. They do not.

Q. Nor do they reflect anything for interest incurred [fol. 5784] or returned on the investment?

A. No, sir.

Q. Do you purport to know what the appropriate amortization figures would be?

A. Not at this time, no, sir.

Q. Or depreciation? A. I do not.

Q. Or depletion of the reserves? You have made no computation in this exhibit for those items at all?

A. No, sir. I have given it a lot of thought but have not arrived at any figure to use for the depletion of reserves.

Q. Now, you have explained heretofore that even to transport the same volumes of gas as pressures in the field become lowered there will be additional compressor expense, I believe.

A. Yes, sir, there will be.

Q. And you have stated that you recognize that in so far as the actual out-of-pocket cost for gas used as fuel is concerned, there would be no appropriate charge for fuel in connection with the compressor station.

A. Yes, there would be an appropriate charge, but what that amount would be would have to be determined. The 15 cent per M. c. f. figure which was used is an arbitrary figure and there would be, naturally; the cost of the royalty [fol. 5785] on the gas and the cost paid to the vendors of the gas which would be a natural out-of-pocket cash item along with the operating expense required to transport the gas from the wellhead to the intake side of the compressor station.

Q. But, if these items are all included as expenditures and there is no charge against the company by way of a set charge on the other side of the ledger, then, it would not be appropriate to consider the 15 cents as an expense charge.

A. That would have to be determined. Whether 15 cents would, I don't know.

Q. Whatever the appropriate charge—

A. (Interposing) Whatever the appropriate charge might be.

Q. Now, in the operation of the compressor stations you state that you have additional gas required and, also, have some additional labor required.

A. That is correct.

Q. And that additional labor, both for maintenance and operations, is reflected in your schedules presented in connection with Exhibit 43? A. Yes, sir.

Q. Why is it that, as your compressors get old, the maintenance cost increases?

A. It might be compared to the cost of the operation [fol. 5786] of the family car. As the car becomes older it costs more to run that car the same number of miles.

Q. Does that same situation apply with respect to all of the other expense items in connection with production of gas, transportation of gas?

A. Yes, any of the—

Q. (Interposing) Any of the maintenance items?

A. Any of the physical plant is subject to a certain amount of depreciation year by year.

Q. I notice that in the year 1940—do you have your exhibit before you—Line 19, there is a very substantial decrease in 1941 over the 1940 cost for maintenance of the production system.

Q. You are referring to Page 1 of Schedule 3?

Q. That is right. A. Yes, there is.

Q. Explain what principle represents that difference between 11,000 in 1940 and only 7,990 in 1941.

A. The difference between the \$11,821 for 1940 and the \$7,990 in 1941 is largely accounted for by the clean-out work which was required on the Field 4-18 well and that

operation was rather fully described in yesterday's testimony.

Q. Have you made allowance for a similar expense in the future years under either the basic load or the anticipated load?

A. No, sir, because one never knows when that condition is going to occur and it is, therefore, impossible to set out a large amount of money in the budget for that purpose.

Q. Do you anticipate that some of your wells in the future will give you water trouble?

A. Oh, without any doubt that will happen to us. For instance, in 1940 our Gregory 18 well had this happen, the production string of casing parted down a distance from the top of the ground. Of course, that allowed the surface water to come in and the formation around the well was completely flooded.

It was necessary to run a new string of pipe into that well.

Mr. Littman: Pardon me, Mr. Culton. I would like to have the witness state, if he knows, the amount of money included in the year 1940 figure for production maintenance in Line 19 of Page I of Schedule 3 for the cleaning out of wells.

The Witness: As I remember that amount, Mr. Littman, it was approximately \$6,000. The reason it sort of stayed in my mind is that I think that we estimated that that operation would cost \$4,600 and it overran by that amount.

Mr. Littman: Have you included any sum in the year 1941 for cleaning out of wells? I refer to the \$7,990 figure [fol. 5788] in Column "C".

The Witness: No, that figure is based on the first six months' actual cost and we did not clean out but one well after that time. That amount—I just can't recall what it was—was under \$1,000.

Mr. Littman: Do you have amounts included in that line for the subsequent years to cover cleaning of wells?

The Witness: Yes, normal cleaning operations.

By Mr. Culton:

Q. What you had reference to was unusual conditions?

A. That is correct. Where, if I may refer to it again, the tools are lost and it is necessary to spend several additional days in trying to recover them.

We think of a normal cleaning-out operation as requiring about seven days besides the moving in and tearing down time.

Q. What has been the nature of your allowance in the subsequent years, 1942 to 1946, for clean-out expenses?

A. I don't remember just how many wells we estimated that we would clean out, but I can tell you this, we estimated that two wells would be cleaned out during the year 1942.

Those wells are in the 1942 budget at this time.

Q. Do you know what the wells are that you expect to clean out at this time?

Q. One of the wells is the Zofness No. 255 and the [fol. 5789] other well is—I just can't remember without going back—

Q. At any rate, you have a definite well in mind?

A. Yes, and a definite well is shown on the budget for our actual operating and maintenance budget for this year.

Q. Now, is that on the normal clean-out job that you have in mind for it?

A. Yes, sir.

Q. All right.

A. For the year 1943 we estimate that there will be three; there will be four in 1944; there will be five in 1945 and six in 1946 that are included in this schedule.

Q. And you have allowed only the usual and ordinary clean-out expense for those wells?

A. Yes, that is right.

Q. Have you, as yet, had any experience with wells salting up?

A. Yes, we have had, some slight experience.

Q. Explain just what is meant by the "well salting up."

A. By the term "well salting up or off", it means that salt in the formation begins to clog the permeability channels.

Q. With what effect?

A. With the forming of a restriction in the formation which will not allow gas to pass through the formation. In

[fol. 5790] other words, it merely blocks off the production from the well bore.

Q. Does it sometimes result in a restriction in the well bore, itself?

A. Yes, it does.

Q. And it sometimes results in restrictions out away from the well bore. Is that correct?

A. Yes. Sometimes the bridge is formed in the well bore, and I believe, that the type of salt that forms the bridge in the well bore is the easiest type to be dealt with because it still shows that there is sufficient permeability left to enable the salt to travel through the formation, but when that bridging starts back in the formation from the well bore it is a very difficult problem.

Q. What method is used for eliminating that bridge when a bridge of salt forms in the well bore?

A. If the bridge is a partial bridge, it can sometimes be removed by pumping water down on top of it and then opening the well to atmosphere.

Q. By that you mean blowing the well?

A. Yes, sir, sometimes it is necessary to run a string of tools in the hole to knock the bridge out.

Q. Is that a more expensive proposition?

A. Yes, that is a more expensive proposition.

We have been fortunate enough to be able to bring the [fol. 5791] wells back, where salting has occurred, by the use of just plain water.

Q. And what is the situation if the salt works into the formation back away from the well bore where the salt is deposited and clogs the channel?

A. Unless it is taken care of promptly, it will usually result in the loss of the well, because as the salt starts to form in the permeability channels away from the well bore it gathers the salt which comes in back of it and forms a very tight bridge.

Q. Have any of the other gas companies producing in that area had greater salt difficulties, so far, than Panhandle Eastern has had?

A. Yes, especially those companies which operate to the east of our general area.

Q. In the Panhandle Field?

A. In the Panhandle Field.

Q. What has been the situation there?

A. Well, Texoma has had to plug several of their wells. By "several" I mean seven or eight. They have lost those wells entirely.

[fol. 5792] Mr. Littman: Were those salted wells located in the east Panhandle Field?

The Witness: Yes, in the LeFors area.

Mr. Littman: How many miles is that from your production?

The Witness: I would say between 25 and 30 miles.

By Mr. Culton:

Q. The pressures over there are lower than they have now reached in your area?

A. Yes, that is true and that is where the real salt danger comes, especially in an area like our Group Area "D" where the water is showing now and it is necessary to have a certain amount of water to dissolve the salt in the formation to carry it into the well bore.

If we encounter serious trouble in the Panhandle Field, I believe it will be in our Group Area "D", although the three wells that have shown the greatest amount of salt are the State Permit well, 1-106, the Rockwell 1-102 and the Sneed 1-23.

Q. Where are they located?

A. Two of them are located in—

[fol. 5793] Q. (Interposing) I don't believe the map is there. Which group area?

A. Two in "B" and one in "F". The wells were checked for salting again late this fall.

Q. That is the wells you have just referred to?

A. Yes, the Sneed 1-23 was not checked for other than a water sample, but the State Permit 1-106 and Rockwell 1-102 were checked for salt by placing a critical flow prover on the well and allowing it to flow and then the amount of salt that was caught on the prover was noted.

I was happy to find that the condition was not as bad as it was two years ago on those wells.

Q. In other words, so far you have been able to control the salt situation all right on the Paphundle Eastern wells?

A. Yes. In the Hugoton Field we have had salting trouble on two wells and those are the ones that were brought back by the injection of just clear water.

Q. And where are those wells located?

A. One is the Light well located—

Q. (Interposing) Can you point out on the pressure map approximately where it is?

A. It is in Section 23, Township 33, Range 39.

Q. It is right below the letter "S" of the word "Stevens", is it, a little to the left?

[fol. 5794] A. It doesn't show on there. We have two light wells. Maybe I better check the location.

Q. Are they close together?

A. Yes.

Q. Just the general area was what I had in mind.

A. It was the area to the west, I might say northwest of Stevens County. The other well is the Greening well which is located in Section 6, Township 35, Range 39, Morton County, Kansas.

Q. Are those wells in high pressure areas?

A. Yes, they are in what would be termed high pressure areas.

Q. To what extent had the salt affected those wells when you went to work on them?

A. The light well had an original natural open flow of approximately 8 million cubic feet for 24 hours and this had fallen off to an amount which, as I recall it, was slightly below 2 million cubic feet for 24 hours.

After the clear water was pumped into the well and left to stand for several hours and then blown back out, the well again came back to approximately its natural open flow.

Q. How about the other well?

A. The other well was a well which was cleaned out by putting a rig over the well and it was plugged back at the time the clean-out was made and acidized, so we don't [fol. 5795] know exactly what it might have done to come back to its natural open flow, but it did shew a nice increase in open flow by the use of acid.

Q. Do you anticipate greater trouble or less trouble from the standpoint of salt difficulties as the pressures become lower in the Panhandle Field?

A. Well, naturally, the difficulties will increase, if they are going to occur, as the pressures become lower.

Q. Have you made any allowance for that possibility?

A. No, sir, I don't think one could reasonably make any set sum allowance for that possibility?

Q. Therefore, in your estimate of operation and maintenance cost, both on the basic load and on the anticipated load, that element has not been taken into consideration?

A. No, sir, because I don't believe that we will have any great trouble until after the year 1946.

Q. It is in subsequent years where you think the greatest difficulty will be?

A. That is right.

Q. Is there any way by which you can tell when that would be or what the cost of it would amount to?

A. No, sir.

[fol. 5812] Q. You stated, I believe, in response to one of Mr. Littman's questions or maybe some other counsel's, that it was possible, physically, to so operate your system as to raise or lower the working pressures required in the [fol. 5813] gathering lines?

A. Yes, that is correct, it is possible.

Q. How is that done, if you want to lower the working pressure?

A. To take more gas away at the other end of the pipe line.

Q. And what does that require?

A. That requires the delivery rate to be increased.

Q. And how is that increased?

A. That is increased by the application of horsepower to the flow.

Q. In other words, you have to build more compressors, is that it?

A. Yes, sir.

Mr. Littman: Couldn't you loop lines, also, and get a similar result?

The Witness: Yes, that is true, Mr. Littman. Much can be accomplished by the looping of pipe line systems and if you will note the expenditures which are shown in Exhibit 42, it does anticipate the looping of a considerable portion of our system as well as the installation of additional horsepower and, again, that is where the economies of development come in,—which is cheaper, horsepower or the looping of lines.

Mr. Littman: That is what prompted my question.

[fol. 5814] The Witness: Yes, sir.

By Mr. Culton:

Q. Then, irrespective of how it is done, the expenditure of additional money for capital investment is required?

A. That is right.

Q. And the economies of the situation will have to be carefully studied to determine whether or not it is economically advisable to operate so as to lower the working pressures at any given time?

A. Yes, that is right.

[fol. 5843] C. H. HINTON a witness, having been previously duly sworn, resumed the stand and testified further as follows:

[fol. 5844] By Mr. Culton:

Q. Mr. Hinton, several days ago you were requested to prepare certain schedules with respect to cost of gas, giving no consideration to the carrying charges on the reserves, on the existing facilities or on the facilities to be hereafter added, and giving no consideration to amortization, depletion, depreciation and replacements with respect to those properties.

Have you now caused that study to be made?

A. Yes, and the results of this study are reflected in Exhibits 142 and 143.

Q. You have been on the stand continuously, but you did give instructions to a representative of the Panhandle Eastern Pipe Line Company, showing him what figures to use in making these studies, is that correct?

A. Yes, that is correct.

Q. And have you now checked over these results, however, to see whether or not he has followed your instructions?

[fol. 5845] A. I have, and found that he has followed my instructions.

Q. In this group of studies, you have divided your study between the two fields and then shown the aggregate for the two fields, is that correct?

A. Yes, that is correct.

Q. And have also shown the total cost of gas produced, and the total cost of gas purchased, is that correct? A. Yes, that is correct.

Q. Calling your attention first to Schedule 2 of Exhibit No. 142, this being the cost of gas purchased per M. c. f. by field on basic load, where did you get the amount paid per M. c. f. of gas?

A. That is the price within 1/100 of one cent. That is established by gas purchase contracts in the two fields.

Q. And the M. c. f. purchased for years shown on Line 21 comes from what point?

A. That comes from an exhibit that was prepared at Mr. Littman's request which bears the number of 132.

Mr. Littman: That is a copy of one of your working papers, is it not?

The Witness: That is right. The exhibit was prepared from working papers.

[fol. 5846] By Mr. Culton:

Q. That is on the basic load?

A. That is on the basic load. That is the only one used in this schedule.

Trial Examiner: You had Exhibit No. 131, which was future production with the anticipated load increase, and No. 132, which was without the load increase, both prepared from your working papers, as I recall it and as the record seems to indicate?

The Witness: That is correct, and 131 will tie in with Exhibit 143.

Trial Examiner: Will 132 tie in to Exhibit 142?

The Witness: That is correct, yes, sir.

By Mr. Culton:

Q. Now, where did you get the transportation costs shown on Lines 4 to 19?

A. Those were obtained from Exhibit 43.

Mr. Littman: From what schedules in Exhibit 43, Mr. Hinton?

The Witness: From Schedule 3, Pages 1 to 3, inclusive.

Mr. Littman: You mean Pages 1 to 2, inclusive, for the particular figures which you have referred to?

The Witness: Yes, for the Panhandle Field that is correct. I was thinking in terms of the entire schedule 2.

[fol. 5848]. By Mr. Culton:

Q. Now, do you find the exact figures in Exhibit 43 that appear on Schedule 2 of Exhibit 142, or have you had to do some apportioning to get these figures?

A. The total is the same but the cost of transporting gas has been apportioned in the percent that the gas which is produced by the company and gas which is purchased by the company is divided.

Q. In other words, the transportation cost which appears on Schedule 2 must be added to the transportation costs shown on Schedule 3 in order to get the total for those various items?

A. Yes, that is correct.

Q. And you have apportioned all of the transportation cost between the produced gas and the purchased gas in proportion to the amount produced and the amount purchased? A. That is correct.

Q. That is true as to all instances where both the purchased gas and the produced gas use the same facilities?

A. Yes, where they use the same facilities, that is true.

Q. Now, for the year 1941, you get a total on Schedule 2 of \$17,000 and then how is that applied to determine the cost of the purchased gas?

[fol. 5849] A. The amount which the company estimates that it will purchase for the year 1941 is divided into the amount of \$817,635.

Q. And the resulting figure shown below represents the cost of gas purchased from the Panhandle Field for each of the years shown, taking into consideration only the elements to which you have referred?

A. That is correct.

Q. Then was the same plan followed in Lines 23 to 36 with respect to the Hugoton Field?

A. Yes, the same procedure was applied.

Q. Then in determining the weighted average cost of the gas for both fields, was that same method applied in Lines 37 to 40?

A. Yes, the same method applies.

Q. Passing now to Schedule 3 of Exhibit 142, purporting to show the production cost per M.c.f. by fields, basic load, what do Items 3 to 13 represent?

A. They include all of the production, operation and maintenance, including the land and lease operation, the royalties, rents, delay rentals, renewal bonus and taxes.

Q. How were the ad valorem taxes apportioned, I mean as between transportation and production?

A. The ad valorem taxes were all applied to the transmission, because it would not have been possible to have [fol. 5850] separated those in the time that was available to prepare this schedule.

Q. Well, I have not checked over this, but I notice that ad valorem taxes appear on the production schedule also.

A. That is gross production.

Q. It should be gross production instead of ad valorem—

In other words, the taxes, so far as the produced gas is concerned, were applied to the production rather than to the transportation?

A. Yes, that is correct. Of course, it makes very little difference in which class they are thrown because the result obtained is the same.

Q. When it gets down to the total cost of the production [fol. 5851] ducing gas?

That is right.

Q. This item per M.c.f. produced for the years shown on Line 15, where do you get that figure, on Schedule 3 of Exhibit No. 142?

A. On line 15 the M.c.f. produced for the year?

Q. Yes, sir.

A. That is taken from Exhibit No. 132 which was prepared—

Q. (Interposing) From your working papers?

A. From my working papers.

Q. Now, was that portion of Schedule 3 relating to the [Hugoton] Field prepared in the same manner which that portion of the schedule relating to the Panhandle Field was prepared? A. Yes, it was.

Q. And Lines 35 to 39 representing a weighting of the prices for the various years?

A. Yes, that is a combination of both fields.

Q. Now, passing to Schedule 4, being the transportation costs per M.c.f. produced by fields, is that the cost as applied to the produced gas? A. Yes.

[fol. 5852] Q. And how were the transportation costs shown on that schedule obtained?

A. They were taken from Schedule 3 of Exhibit 43 and they were divided on the basis of the percents which were produced and purchased.

Q. The same way as the transportation cost on the purchased gas?

A. That is correct.

Q. Now, passing to Schedule 5 of Exhibit No. 142, a summary of the production and transportation costs by field, I am not certain myself as I have just [look] at that, whether those figures are weighted.

If not, they should be weighted, on Schedule 5.

A. Yes.

Q. Do you know whether that is an arithmetical total or a weighted total?

A. That is a weighted total which was obtained from the previous pages of this exhibit. They have already been weighted before being carried over.

Q. Then these figures show what the total costs of producing would be, the total transportation cost and the total from both fields, is that correct?

A. That is correct.

Q. Then was Exhibit 143 prepared in the same way that Exhibit 142 has been prepared?

[Vol. 5853] A. Yes, sir, the same procedure was followed.

Q. And schedule 1 on each of those exhibits is a summary of those sheets which follow?

A. That is correct.

Mr. Culton: Mr. Examiner, may I suggest at this time that it might be advisable for Commission counsel, if he liked, to hold a round-table discussion about this.

There has not been time, frankly, for us to check it nor for them to check it either, and it might be, by taking a little while and holding what we, in some court cases, call a pre-trial conference, that the minds of all parties might get together more quickly on just exactly what this represents.

Trial Examiner: Mr. Littman, do you welcome this suggestion?

Mr. Littman: I do not believe that we are yet in a position where we can intelligently discuss these two exhibits without having first an opportunity to check the exhibit and to study the exhibit.

This exhibit involves a number of allocations and I might state, at first blush, it appears to be subject to some very serious mathematical infirmities. I say that, of course, subject to further study and check.

I do not think that we can be in a position to discuss this exhibit, cross-examine on it or to confer on it without having an opportunity to study both of these exhibits. I think perhaps we may be able to complete our study and check over the weekend. I want to facilitate the matter as much as possible, but I certainly would not want to go on record at this writing without [have] had an opportunity to further study the details of these exhibits.

Mr. Culton: I want to frankly say to counsel and to the Commission that this has been hurriedly thrown together and I have my serious doubts whether the items shown on Schedule 1 are correctly weighted.

I have my doubts whether the young man has weighted those figures.

Mr. Littman: That is what was disturbing us.

Trial Examiner: In view of the statement just made, the Trial Examiner will declare a ten-minute recess to permit Mr. Hinton to discuss and explain to the staff of the Commission and Mr. Littman the method of approach and the source of data which are involved at this point in consideration of these proposed exhibits.

(Whereupon, a short recess was taken, after which the hearing was resumed.)

Trial Examiner: Gentlemen, as a result of the conference which you have just concluded, have counsel some statement to make?

Mr. Culton: Mr. Examiner, as I suspected and as counsel [fol. 5855] for the Commission had also immediately discovered when he looked at this exhibit, the young man who prepared it did not weight the costs shown on Schedule 1.

Therefore, Mr. Hinton desires to prepare a new Schedule 1 on each of those exhibits showing a weighted cost.

Trial Examiner: That Schedule 1 to which you refer is, in effect, the summary of the succeeding pages?

Mr. Culton: That is right. That is true as to both Exhibit No. 142 and Exhibit No. 143.

Now, we have also thought it might be of some advantage for Mr. Hinton and Mr. Dunn, representing the Commission, to get across the table this afternoon and check their figures and they might save the Examiner and the rest of us who are engaged in this case some time so as to be able to report Monday where there are any differences.

In doing this, we will be checking not only the figures which Mr. Hinton has caused to be made, but we will also be checking the figures which the Commission, in a hurried calculation, used several days ago, and I think we will arrive at what is unquestionably the arithmetic answer as to these particular matters.

There is no difference between Mr. Hinton and the Commission's staff as to the proper method to be used in

doing this. It is just purely a matter of arithmetic and using a comptometer machine.

[fol. 5856] Mr. Littman: I might state in connection with your statement, Mr. Culton, that a member of our staff is now checking Mr. Hinton's exhibits Nos. 142 and 143, and will be glad to meet with Mr. Hinton at the conclusion of this morning's session with a view to agreeing upon the mathematics of the exhibit.

I might state that we believe that our total unit cost figures which I read into the record a day or so ago are correct.

I cannot say at this time whether we will subscribe to any allocation of that total as between gas purchased and gas produced without first having an opportunity to examine carefully the method of allocation. I might say that personally, I cannot see that any allocation of transportation costs or any allocation of costs of operation and maintenance, as between purchased gas and gas produced, would make any difference in the over-all picture.

Mr. Culton: It should not, so far as the weighted totals are concerned.

Trial Examiner: You have in mind, when you say that it should not produce any difference, you have in mind [fol. 5857] the weighted average cost at Liberal?

Mr. Littman: The weighted average over-all cost at Liberal compressor station.

Trial Examiner: Yes.

Mr. Littman: Because this witness has testified to the precise amounts of gas that will be produced and purchased and delivered to Liberal for the next five years under the basic load theory and under the anticipated load theory.

Therefore, when we get the unit cost for the weighted average total at Liberal, in my judgment, then we have all that this Commission would need. However, if counsel for Panhandle Eastern wish to make a point of showing an allocated breakdown as between the two types of gas

which I mentioned, of course they are at perfect liberty to do so.

I wanted to make it clear, though, that we personally fail to see at this moment the necessity for the allocation. However, our staff will be glad to meet with Mr. Hinton and work together to the end that there will be no disagreement upon the mathematics of the figures.

By Mr. Culton:

Q. Mr. Hinton, these exhibits, No. 142 and No. 143, with respect to cost of production and cost of transportation include those costs south and west of the intake at Liberal station, is that correct?

A. That is correct.

[fol. 5858] Q. And include no costs for Liberal station and no costs from Liberal station east?

A. That is correct.

Q. In other words, your study has been related wholly to the question of delivering gas into the station at Liberal?

A. And to what might be better described at the field end of the main transmission line.

May I make some explanation there. Mr. Littman said that he could see no reason for separating these, and I might explain that they were handled in the manner that they were [was] to show that the cost of handling this gas is ever increasing and the cost of producing is increasing and, naturally, the purchase price remains the same because that is a contractual price.

Q. Is there any difference in the cost of producing and purchase, in your judgment, after 1946? Will there be any change in those respective costs?

A. Yes, there will be. You refer now to the handling and producing of gas?

Q. Yes.

A. Yes, they will, without any doubt, be ever increasing after that year.

Q. For the same volumes of gas?

A. For the same volumes of gas.

Trial Examiner: Why do you expect that, Mr. Hinton?

[fol. 5859] The Witness: Because as the pressures become lower in the wells, it is going to require a greater number of wells to furnish the same amounts of gas and the pressure, as it declines, will require that we install additional power in the field and additional fuel and help will be required.

Mr. Lee: Would that be true if you took your gas from newly-acquired fields?

The Witness: No, not at first. If we went to a field that had a higher pressure than these fields, it would not but, of course, this is limited to the Panhandle Field and the Hugoton Field.

Mr. Lee: Yes, but does your statement take cognizance of new acreage acquired in the Hugoton Field that might have a higher pressure?

The Witness: Yes, it does.

Mr. Lee: Do I understand, then, that that possible additional acquired acreage, of which you have already acquired about 30,000 additional acres, as I recall it, and which you may increase greatly in the Hugoton Field, will have a lower pressure at that time than it would if it were taken out?

The Witness: Wells that are drilled in the developed area, usually the pressure on these wells is found to be about the same as the pressure that is observed on the other wells in that area; and the fact that a well is drilled ten years from now does not mean that we will obtain [fol. 5860] near-virgin pressures on that well, but the pressure which we will obtain will be about the same as those on surrounding wells.

Mr. Lee: But nevertheless, is there a possibility that, if you drill this additional acreage ten years from now, it may have virgin pressure. Is that a possibility?

The Witness: That is a very rare possibility.

Mr. Lee: But, regardless of whether it is possible or not, you have treated it at what the pressure of the now-drilled wells will be at that time?

The Witness: Yes, sir.

[fol. 5864]

Recross-Examination

By Mr. Littman:

Q. Now, I do not understand your answers to your counsel with respect to the differences between Mr. Davis' estimate of recoverable reserves for the Panhandle Field and yours.

You have stated heretofore in cross-examination that, as of the end of the year 1940, Mr. Davis' reserves in the Panhandle Field of 17 trillion cubic feet were approximately 70 percent in excess of your estimate. Is that correct? Haven't you so testified?

A. I believe that I have on the 17-trillion figure, but the 17-trillion figure is based upon an assumption that the [fol. 5865] field would be produced down to a pressure of 30 pounds equilibrium pressure.

Q. In other words, Mr. Davis assumed that 17 trillion cubic feet could be recovered down to 30 pounds abandonment pressure? A. Yes, sir.

Q. After September 30, 1940, is that correct?

A. I do not remember whether that figure was after September 30 or November.

Q. Well, it was as of September 30, 1940, but it would not make much difference whether it was September or November, would it? A.

A. No, it is not worth considering in this size reservoir.

Q. Now, you have heretofore in your cross-examination stated the amount of gas recoverable in the Panhandle Field as of the end of 1940, have you not? A. Yes.

Q. And what was that amount?

A. The cumulative withdrawals to the end of 1940 are shown on Exhibit 134 to be 8,325,985 M. M.c.f.

Mr. Wheat: That is a sum in excess of 8 trillion cubic feet, is it not?

The Witness: Yes, that is correct.

By Mr. Littman:

[fol. 5866] Q. You see, I am not asking for withdrawals. I am asking for your estimate of reserves, Mr. Hinton.

A. I thought you asked for the amount shown on this exhibit as of 1940.

Q. I am asking you to repeat your estimate of recoverable reserves in the Panhandle Field as of the end of the year 1940 as indicated by your Exhibit 134.

A. If we take the 21 trillion which I referred to, that being the largest amount, my testimony is that ~~it is my belief that the amount of gas originally in place was between 20 and 21 trillion cubic feet.~~

Mr. Culton: That is the recoverable gas?

The Witness: Recoverable gas.

Mr. Littman: Will you read that answer back?

(Whereupon, the last answer was read by the reporter.)

The Witness: Now then, by deducting the total withdrawal [fol. 5867] through 1940, we find an estimated remaining reserve of 12,675,015 M. M.c.f.

By Mr. Littman:

And that is your estimate of the remaining recoverable reserves in the Panhandle Field as of December 31, 1940?

A. At the rate of withdrawals shown on Exhibit 134.

Q. What does the rate of withdrawals have to do with it? You are going to recover that much gas whether it is recovered in the next 15 years or in the next 25 years, is that not correct?

A. That is not correct. The rate of withdrawal is the governing factor on the total amount of gas that will be recovered from this field.

Q. How does that affect the total recovery?

A. By the fact that if this rate of withdrawal continues, it is going to not give the gas time to migrate through the formation and the wellhead pressures will be considerably lower than if the rate of withdrawal was one-tenth of that shown on Exhibit 134.

You can see that there is a very definite thing to be kept in mind there on the rate of withdrawal when the total recoverable gas is considered.

Trial Examiner: Do you mean necessarily one-tenth less?

The Witness: I just mean that it would have to be much lower than this to enable the gas to flow from the [fol. 5868] areas of higher pressure to the well bores when the pressure in the field has been reduced to the point that it will be in the few remaining years and one-tenth was just a figure that I had in mind.

It might be produced at a somewhat greater rate than that and still obtain much higher pressure at the wellhead.

By Mr. Littman:

Q. Well, what abandonment pressure are you using in arriving at this 12,675,015 M.M.c.f. recoverable reserves as compared with Mr. Davis' 17 million M.M.c.f.?

A. That is zero pounds.

Q. Now, what would your figure be if you used Mr. Davis' 30 pounds of abandonment pressure? Your recoverable reserves would be lower; would they not?

A. Again, there comes in the rate of withdrawal to be considered.

Q. Well, suppose you state now your estimated recoverable reserves, using the 30-pound abandonment pressure, rather than zero which you used in computing the 12,675,015 M.M.c.f. figure.

A. You asked for the total recoverable reserves, did you not?

Q. Yes, indicated by your Exhibit 134.

A. At 29.65 pound wellhead pressure, my exhibit shows that the estimated amount will be 19,405,985 M.M.c.f.

[fol. 5869] Mr. Culton: That is well-head pressure?

The Witness: Yes, sir.

By Mr. Littman:

Q. How about deducting the withdrawals to the end of 1940 from that figure to get your estimated recovery? It is the estimated recoverable reserves that I want.

A. That would be 11,080,000 M.M.c.f.

Q. Now, Mr. Davis has estimated that the recoverable reserves in the Panhandle Field; as of very close to the end of the year 1940, is 17 million M.M.c.f., is that correct?

A. That is correct.

Q. Using 30 pounds as the abandonment pressure, is that right?

A. That is right.

Q. And your figure, using 30 pounds as the abandonment figure for the recoverable reserves as of the end of 1940, is 11,080,000 M.M.c.f.?

A. That is correct.

Q. Now, will you tell me the process of reasoning by which you now claim that Mr. Davis' estimate, which appears to be approximately 6 million M.M.c.f. higher than yours, is the same as yours or even less than your estimate?

A. Mr. Davis estimated that there would be approximately 300,000 acres in the field that would have a gas content that would be only 60 percent of the average.

[fol. 5870] Mr. Culton: That is the average in the better part of the field, he said?

The Witness: Yes.

Mr. Littman: Just a minute. Where do you find that?

Mr. Culton: Page 6, Exhibit 75.

Mr. Culton: You had started on a statement when he broke in.

The Witness: Excuse me. I have to have it read back again.

(Whereupon, the last answer was read by the reporter.)

By Mr. Littman:

Q. Now, you can continue.

Mr. Culton: Exhibit 75, Page 6.

Mr. Wheat: Mr. Littman, you didn't finish your sentence.

By Mr. Littman:

Q. Will you continue your statement of the reasons why you now state that Mr. Davis and yourself have arrived at approximately the same recovery?

Mr. Culton: You understand, he never has made that statement.

The Witness. No, I have not.

Mr. Littman: What he said sounded very much like that to me.

Mr. Culton: He said if you apply Mr. Davis' computations, the differences on those two elements wherein he [fol 5871] differs from Mr. Davis, that his estimate will be in excess of what Mr. Davis' estimate is.

By Mr. Littman:

Q. Is Mr. Culton's statement a correct statement of your testimony? A. Yes.

Mr. Culton: Read it. In other words, that is what it is.

By Mr. Littman:

Q. In other words, if Mr. Davis had done certain things which you think he should have done in arriving at his estimate, it is your testimony that he would have arrived at approximately the same figure as that which you reached?

A. Yes. If Mr. Davis would have made the same interpretation of the reservoir size, as governed by the thickness of pay over the same number of acres, my estimate would have been in excess of Mr. Davis'.

Q. That is merely your way of pointing out wherein you and Mr. Davis didn't agree?

A. That is correct. I just wanted to show that on the general picture we are in agreement. It is just the interpretation of the data; and he is working with equilibrium pressures and I am working with wellhead pressures.

Q. Now—

Mr. Culton: (Interposing) Had you finished your explanation that you started to make?

[fol. 5872] The Witness: No, I was just—

Mr. Culton: (Interposing) Just show exactly what the difference is between your judgment and Mr. Davis' judgment.

The Witness: Well, in just round numbers, Mr. Davis has given 300,000 acres of the total field 60 percent as much gas as the acreage in the better part of the field; "better than average", he says.

Now then, my interpretation is—

Mr. Wheat: (Interposing) You mean better than average part of the field?

The Witness: Yes. My idea of that acreage in round numbers is that there will be about 400,000 which will have

approximate 50 percent as much gas as the better part of the field and there will be another additional 400,000 acres that will have considerably less, so by placing--

• Mr. Culton: (Interposing) Less than 50 percent, you mean?

The Witness: Yes, less than 50 percent and that places my estimate on the portion of the field which Panhandle Eastern operates in excess of Mr. Davis' figure which he would apply there, working on average figures.

By Mr. Littman:

Q. Mr. Hinton, that isn't the way in which you arrived at the estimate of remaining gas in Exhibit 134?

A. No, I checked it by that method, the reservoir content required.

[fol. 5873] Q. Your estimate reflected in Exhibited 134 is predicated upon the rate of rock-pressure decline per M.c.f. produced, which rate is shown in the chart, Exhibit No. 135. Is that correct?

A. Yes, but I have also testified that if it would not have checked with known geological data rather closely, that I would not have used it.

Q. But in arriving at the figures shown in Exhibit 134 of the amount of M.c.f. which will be ultimately recovered from the Panhandle Field, you applied mathematically the rates of pressure decline per trillion M.c.f. produced in the field, literally, did you not?

A. Yes, as governed by rates of withdrawal.

Q. And the question of acreage and size and extent of the reservoir was just so much background rather than anything that actually entered into the calculation whereby you arrived at the figures in Exhibit 134?

A. Yes, that is right. It was a check on that method.

Q. Now, Mr. Hinton, in your redirect examination you gave some testimony with respect to an alleged connection between the Panhandle and the Hugoton Fields.

Did I understand you to say that in your opinion there was a connection between these fields in so far as the pay strata are concerned?

A. Yes, I did say that was my belief, although it is [fol. 5874] yet to be proven by the drill.

Q. Is it simply your guess about the matter or is your belief based upon certain definite physical data?

A. My belief is based on certain definite physical data.

Q. And I presume that those data were derived from certain wells drilled in that vicinity?

A. Yes, the wells drilled in the two fields.

Q. Now, have any wells been drilled in this so-called narrow neck that lies between the two fields?

A. No, sir.

Q. I would like to have you state the physical facts upon which you base your conclusion with respect to the joining of the pay strata of these two fields, namely, the wells and showing the locations of the wells on one of the maps on the wall.

Suppose you refer to map, Exhibit 26.

A. Well, Mr. Littman, my belief is not based on any certain wells. It is based on all wells drilled in the two fields.

Q. Well, suppose you state the basis of your belief.

A. The basis of my belief is the virgin rock pressure in the two fields, the depth at which the pay lies in the two fields above sea level, the type of formation encountered in each of the two fields.

[fol. 5875] Q. Suppose you state the factors which caused you to believe that the two fields are physically joined.

A. The observed virgin rock pressure in the two fields is somewhere between 430 and 435 pounds on the wells that were originally drilled closest to the extension or outline boundary shown on Exhibit 26.

Q. How would that fact lead you to conclude that the two fields are joined?

A. Because it could certainly lead me to believe that in a gas field of this nature where the formation pressures are not normal that there must be some connection of the drive that built the pressure up to the point to which it was built, because I don't think that it could happen that there would be two separate fields that would have the same water drive that would produce the same abnormal pressure condition.

Mr. Wheat: The abnormal low pressure?

The Witness: Yes.

By Mr. Littman:

Q. Mr. Hinton, if there was a connection between these two fields, isn't it a fact that the extensive production from the Panhandle Field would have had its effect upon the rock pressures of the wells in the Hugoton Field, particularly those wells which are located close to the Panhandle Field?

A. That would be a reasonable assumption, Mr. Littman, but at the same time I refer you to the condition that [fol. 5876] exists between our Burnett 1-108 and our Burnett well 86. Within a space of approximately two miles there is a difference of over 100 pounds in the pressure.

I can readily see that that condition might exist there because there might be a tight area of extremely low permeability existing between the two fields which would still be the same general pay formation.

Q. Well, it would have to be very tight in order for the production in the Panhandle Field to have not reduced the pressure in the Hugoton Field in that vicinity.

A. That is true, but I still don't believe that we have the best information on that pressure condition at this time, and I think that there will be wells drilled which will definitely prove that.

Thinking in terms of geological data, it seems to certainly indicate that the two general series of lime were laid down during the same geological age.

Q. Maybe they were, but the point I am driving at is whether the pay strata of the two fields actually join.

A. That is my opinion, that they do, and it is based on the data which I have just given.

Q. Well, that was one of them, that was one of the reasons that you gave, to-wit, the fact that the virgin pressure in both fields was the same, approximately.

A. Yes.

[fol. 5877] Q. And you adhere to that, notwithstanding the fact that the virgin pressure in the Hugoton Field has remained the same, notwithstanding the production from the Panhandle Field. Is that correct?

A. Well, if you will notice, it is only very recently that the pressure in the Panhandle Field has been pulled

down lower than 50 pounds at virgin pressure in that field and if that is a tight neck in there, with that gradient in pressure coming from thousands of acres as slowly as it would be, it would be migrating from a considerable distance to fill that space up.

I don't believe that we are going to be able to tell definitely whether they are connected, only by drilling wells throughout the area where they might be connected.

Mr. Wheat: You mean "except" rather than "only"?

The Witness: Yes, except by drilling.

By Mr. Littman:

Q. In other words, you are not going to be altogether certain about your opinion with respect to the joining of these two fields until such time as the drill proves your theory?

A. That is correct. If we would have had proof, those two fields would have shown to be connected on Exhibit 26 instead of the space which is shown between the two fields on the map.

Q. Yes. Exhibit 26 clearly shows that the author of [fol. 5878] that exhibit did not join the two fields and shows a separate color for each field and white space between the two, does it not?

A. It also shows the south boundary in a dotted line which shows that in his mind he was not sure whether that was the southernmost possible extension of that field.

Q. And who was the author of Exhibit 26?

A. I don't know whether Dr. Bartle or Rufus Smith is the author of that.

Q. I believe I am correct in stating that Mr. Smith was the author of the lower part of the map which shows the Panhandle Field and that Dr. Bartle was the author of the upper part of the map showing the Hugoton Field and that they did, to some extent, collaborate with each other on both. Is that a correct statement, Mr. Culton?

Mr. Culton: It is intended to be correct but there is this inaccuracy, Mr. Smith said he adopted the Railroad Commission's map for the Panhandle Field. He drew the outlines for the Panhandle Field from that shown on the official Railroad Commission map.

He and Dr. Bartle worked together in preparing the map of the Hugoton Field.

By Mr. Littman:

Q. What other physical facts, if any, do you have which lead you to the conclusion that the two fields join? [fol. 5879] A. The fact that both fields produce gas from limestone which lies approximately the same elevation above sea level, indicating that the limestone was laid down during the same geological age.

Q. Well, now, you have named two physical facts, so-called by you, that led you to believe these two fields are joined. A. Yes.

Q. Now, both of those physical conditions could exist if there were a fault between the two fields, couldn't they?

A. No, they couldn't, because if there was a fault your line would be encountered at different elevations.

Q. Both of those conditions could exist even though there were no connection between the two fields, could they not?

A. That is most certainly correct.

Q. Now, will you give us a third reason, if you have any, for believing that the two fields join?

A. I believe that I have given the principal reasons upon which my belief is placed.

Q. That is, you gave two.

A. Or two, rather.

Q. Two reasons. Now, would I not be correct in characterizing your ideas on this subject as simply a hunch that the two fields join, rather than a scientific conclusion [fol. 5880] from basic physical data?

A. No, I don't base my hunches on like facts. A hunch to me is something that you project in the future, but my belief is based on the pressure and the pay and I think that it is fairly safe to assume that the two fields are connected, but I am not going to bet any money on it.

Q. You wouldn't want to bet any money on it?

A. Yes, I would like to bet a little but I don't think I shall.

Mr. Culton: Whether they are connected or not doesn't affect any of your exhibits or any of your studies. You didn't take that, whether it is connected or whether it isn't connected, into account in any of your studies?

The Witness: No, I gave no,—that is, it bears no relationship to the problem.

Mr. Culton: Your expression of your judgment as to whether or not it was connected was in response to the questions by the Examiner inquiring as to the amount of drilling which has taken place in the two fields?

The Witness: There is one other thing which I neglected to tell Mr. Littman, and it is necessarily hearsay, because I am not a geologist, but I think that the geologists will tell you that the same fossils appear in that formation which, again, would indicate the same geological age.

By Mr. Littman:

[fol. 5881] Q. All these matters that you state you considered might very well exist even if there were no joining of the two fields. Is that correct?

A. It is possible that they could exist, but not probable.

Q. At any rate, there is no present proof of the joining of the two fields, is there?

A. That is correct, there is no present proof.

Trial Examiner: May I ask further, following that up, whether the fact which is known would in any way affect data concerning which you have testified, indicating that in the south end of the field, if they are adjoining, in what is now known as the Panhandle Field, the migration of gas is much more rapid than in the upper part of the field which is known as the Hugoton Field?

The Witness: There is nothing involved in the connection of those fields that would change any of my testimony, costs, or capital additions, in any manner for the period considered.

Trial Examiner: In other words, a high degree of permeability of the producing strata may exist in the south end of the field as compared with the northern end of the field, irrespective of whether or not the fields are, in fact, connected?

The Witness: That is true.

Trial Examiner: And if they are connected together by [fol. 5882] ultimate exploration, the single field will then

have a north and south length of approximately 200 miles, will it not, more than 200 miles?

The Witness: Yes, it will be in excess of 200 miles.

By Mr. Littman:

Q. Mr. Hinton, in your redirect examination you discussed the subject of carbon black production in the Panhandle Field. Am I correct in understanding that at the present time carbon black is produced exclusively from sour gas in the Panhandle Field?

A. No, not exactly, because there are some sweet wells in one portion of the field there that I believe there is a special permit to use for the manufacture of high-grade carbon black.

They reclassified several wells down there during the early part of last year and it is in very few that that condition exists.

Q. In other words, substantially all of the carbon black produced in the Panhandle Field is produced from the sour gas, is that right? A. Yes, sir.

Mr. Cifton: Well, sweet casing head gas is used for that purpose, isn't it?

The Witness: Oh, yes, it is. That is the gas that comes from the oil wells.

[Vol. 5883] By Mr. Littman:

Q. But most of it is produced from—

A. (Interposing) The majority of it is manufactured from gas bearing wells with sulphur content.

Q. What is the average field price of the sour gas in the Panhandle Field which is being used for carbon black purposes?

A. As far as I know, and I believe it is correct, .6 of one cent per M.c.f.

Q. Now, I believe you testified that the cost of treatment of sour gas, in order to sweeten that gas and make it usable for pipe line purposes, is one-half a cent to $\frac{3}{4}$ of a cent per M.c.f.?

A. Yes. I am speaking of just the operating cost without giving consideration to the expenditures required.

Q. I thought operating costs included expenditures. What expenditures are you referring to?

A. I am speaking of the money that will be required to build a sweetening plant.

Q. Oh, you are speaking of the capital expenditures?

A. Yes, sir.

Q. In other words, the one-half cent to $\frac{3}{4}$ -cent figure represents all costs of processing, exclusive of the capital costs? A. Yes.

[fol. 5884] Q. Have you any idea of what the capital costs would be, approximately?

A. No, I don't know what a sweetening plant would cost, because there is no sour gas acreage available there and we have not gone into that.

Mr. Culton: It would depend, on the volume processed, what your plant would cost?

The Witness: Yes.

I neglected to say that that cost per M.c.f. would be on a large volume basis.

By Mr. Littman:

Q. Well, a pipe-line company would naturally go into volume production; would it not?

A. Yes, I feel sure it would.

(Discussion off the record.)

By Mr. Littman:

Q. Don't you consider it a distinct possibility that pipe line companies will more and more turn to the sour gas fields for their supply, as the years go on, in the future?

A. Not unless it is done under a law. I am afraid it will never happen unless there is somebody that causes it to come about. I have a fear that it will never happen under the present laws.

Q. Well, as gas becomes more valuable and as the field becomes more and more depleted, isn't it a distinct possibility that pipe line companies will turn to the sour gas, being able to pay more at the wellhead for that gas than carbon black people are able to pay?

A. Yes, but it is, under contract to the carbon black people and unless it would be purchased from the carbon black people, I don't know how that could be achieved.

Then, again, as the supply becomes depleted, why, then operating costs will go up to the extent that it will just

have to be worked out, whether it would be a paying proposition at that stage of the withdrawal from the field.

Q. Well, you don't think the carbon black people would turn down an offer, if it were attractive enough, to sell out to the pipe line people under the conditions that I suggested?

A. The carbon black plants are not operating without profit. Just because they pay .6 of a cent for the gas is no sign that that is all they make out of it.

Q. Do you know what the history of the Appalachian Field was in that regard? A. No, I do not.

Q. Don't you know that in the Appalachian Field the carbon black people have sold out to the pipe line companies and have virtually ceased production in West Virginia, for instance? Don't you know that?

A. Could you tell me—are you not trying to ask the attorney a question—what the price of gas is in the Appalachian Field?

Q. Yes, I think I can tell you. I know that in West Virginia it probably ranges anywhere from 10 cents to as high as 20 cents per M.c.f. I know that the average field price of gas at the wellhead in the vicinity of Akron is 18 cents per M.c.f.

The Witness: The reason I asked that question was because I just wondered what the price of gas would have to become before it would be possible to get the carbon black plants to stop using it for the manufacture of carbon black and sell it to pipe line companies.

By Mr. Littman: I

Q. Well, I cannot supply you the figure that was reached when the carbon black people sold out. I am sorry I don't have that information for you.

A. I think you have a very good idea there, if it could be carried out, and it is one that I have given much thought to the past years, wondering how it could be brought about that sour gas would be processed and used for light and fuel purposes.

[fol. 5887] By Mr. Littman:

Q. If the true weighted average rock pressures could be determined at intervals from the beginning of the field

and the volumes of gas withdrawn from the beginning during those intervals could be determined accurately, would you say that the production per pound drop of rock pressure in the Panhandle Field would be constant from the beginning?

A. It is probable that it would not be exactly constant because it is not a perfect reservoir.

Q. What do you mean by that?

A. I mean that if there is a resistance to flow through the formation and if the rate of withdrawal is in excess of the ability of the formation to prevent the passage of gas at the same rate without dropping the pressure, then in all probability it would not be the same throughout the life of the field because the pressures which would be obtained would not be taken at intervals after the wellhead had been closed that would be sufficient to enable the pressure to equalize throughout the field.

Q. Mr. Hinton, you are assuming something that I didn't assume in my question. I am assuming that you have the true weighted average rock pressures.

[fol. 5888] Mr. Culton: You mean by that the equilibrium pressure? If not, I would like to have true weighted rock pressure defined, myself.

Mr. Littman: It connotes more than equilibrium pressure. It means the exact, precise weighted average rock pressures.

Mr. Culton: In weighting what elements?

Mr. Littman: Weighting the volumes below the earth.

Mr. Culton: Weighting thickness, permeability and porosity?

Mr. Littman: Yes, that is right.

By Mr. Littman:

Q. You understand, Mr. Hinton, my question is transcending the matter which you just mentioned. I am asking you this:

If the true weighted average rock pressures could be determined at intervals from the beginning and the volumes of gas withdrawn from the beginning during those intervals could be determined accurately, would you say

that the production per pound drop of rock pressure in the Panhandle Field would be constant from the beginning? A. I would say that it would.

Q. Now, the reason why you claimed this result is not obtained from the data published by the Texas Railroad Commission for the five-year period, August 1, 1935, to August 1, 1940, is because the pressure data published by [fol. 5889] the Commission are not, in your opinion, the true weighted average rock pressures of the Panhandle Field?

A. They are not true equilibrium pressures, no, sir.

Q. And that is why you claim that a uniform production per pound of rock pressure decline can not be obtained? A. That is right.

Q. And the figures, the pressure figures that we are now discussing, are those which appear in Column 3 on Page 10 of Exhibit 42, are they not, in the last 4 lines, to be exact? A. Yes.

Q. That is, you didn't use the figure of pressure loss shown in the first line for any purpose, did you?

A. No, just merely to see how it looked.

Q. Now, you have stated certain reasons why, in your opinion, the pressures of the Texas Railroad Commission are not true weighted average pressures, have you not?

A. Yes, I have.

Q. And one of those reasons was that the well observations are not altogether accurate because wells are shut-in for different periods prior to the reading?

A. That is right.

Q. Now, I believe you stated the minimum period required by the Texas Railroad Commission is 72 hours? [fol. 5890] A. That is right.

Q. But no maximum period is required?

A. That is, also, correct.

Q. And, therefore, wells are read anywhere, as you stated yesterday, from 72 hours after the shutting-in of the well to as late as one month after the shutting-in of the well, is that correct?

A. Yes. That is on wells which are producing. There are a number of wells that are closed-in a year before the pressures are obtained.

Q. Now, of course, the longer you shut-in a well before reading, the more likely you are to get the equilibrium pressure. Is that correct?

A. Yes, the stabilization time tends to equalize throughout that area.

Q. In other words, after the well is shut-in, the pressure builds up higher and higher until it finally reaches the highest point that it can reach and then you have what is known as equilibrium pressure?

Mr. Culton: That would depend on whether or not other wells were producing out of—

The Witness: (Interposing) I thought you meant around the well bore.

By Mr. Littman:

Q. I meant around the well bore, any certain well.

[fol. 5891] A. I just wanted to add that some wells will build up in a few hours and others will still show a build-up at the end of several weeks.

At any rate, one of the reasons for inaccuracies creeping into these pressures published by the Texas Railroad Commission is the fact that wells are shut in for varying periods?

A. Yes, that is one of the factors.

Q. And, of course, one well may be shut-in 72 hours in one year and then be shut-in a month in the next year.

A. That is right.

Q. And, in your opinion, you would like to have the Railroad Commission specify a definite period before the reading is taken, would you not?

A. I think that is necessary in any field to obtain data that could be used for a straight pressure decline calculation.

Mr. Culton: Meanwhile what would the public do for gas if those fields were shut-in for a period of time?

The Witness: That is not what I meant.

Mr. Culton: I was speaking from the practical standpoint.

The Witness: Again, that is not what I meant. I mean that there should be a minimum and a maximum time for observing pressures.

By Mr. Littman:

[fol. 5892] Q. Now, as you stated a moment ago, all wells do not build up at the same rate; do they?

A. That is right.

Q. A highly permeable well will reach its equilibrium pressure much sooner than a less-permeable well, is that right? A. That is right.

Q. And so you have those differences, too, that enter into the figures of the Railroad Commission. Is that right? A. Yes, sir.

Q. Now, in that connection is it correct to state that the differences in the production or pull on the well immediately prior to the shutting-in and reading will have an effect upon the correctness of the observation? Is that correct?

A. Yes. It will have an effect on the correctness of the observation.

Q. Will you tell us why that is, briefly?

A. Because if a greater amount of gas has been pulled from the area immediately around the well bore it will, likewise, take a greater period of time for that gas to flow back into that same area to build the pressure up.

Q. Will you tell why, in taking the rock-pressure readings of your wells from year to year you will sometimes have a higher wellhead pressure in 1941 than, for instance, [fol. 5893] in 1940, notwithstanding the fact that considerable gas had been withdrawn during that period?

A. Yes, and another thing that sometimes happens it that the rate of withdrawal is retarded and the gas flows in faster than it has originally been [being] taken and there will be a pressure built up.

Q. Now, another reason that you gave why the pressures of the Texas Railroad Commission are not the true weighted average pressures, in your opinion, was the fact that the Railroad Commission does not weight the pressure readings against the pay thickness. A. That is right.

Q. This is the reason that you have referred to as the failure to take into account the fourth dimension?

A. That is right.

Q. Now, even if you weighted the pressures against the pay thickness, you still wouldn't have an altogether accurate result, would you, because of the differences in porosity of the pay sand throughout the field?

A. That is correct.

Q. You agree with Mr. Rufus Smith, who has previously testified in this proceeding, that the porosity varies greatly throughout the Panhandle Field?

A. Yes, sir, I do.

Q. So if you wanted to be 100-percent accurate about [fol. 5894] this fourth dimension, so-called, you would have to know the porosity and weight the pressures against the porosity as well as the pay thickness, would you not?

A. That is correct.

Q. And then you, also, gave some further reasons why the pressures of the Texas Railroad Commission are not the true weighted average pressures, namely, reasons such as the inability to precisely determine the exact location and proper location of the isobars on the pressure maps. Is that right?

A. Yes, that goes right back to the fault of the same class of porosity.

Q. So that these pressure figures of the Texas Railroad Commission are subject to all of these infirmities which you have enumerated and which I have recapitulated, is that right? A. Yes.

Q. And you have used those pressures, to-wit, the pressures published by the Texas Railroad Commission, in this study which you have submitted in Exhibit 42 and Exhibit 43. Is that right?

A. Yes, I know of no other source of information that is better.

Q. Now, I ask you to refer to Exhibits 136-(1) to (10), inclusive, showing the pressure-trends of the wells in the [fol. 5895] various areas. Now, are the wellhead pressures shown on these charts for the years 1941 and prior thereto those which have been reported by Panhandle Eastern and its vendors to the Texas Railroad Commission?

A. Only after the year 1935, and those are not reported to the Railroad Commission. Their representative actually conducts the taking of these tests and gives us the reading. We don't give it to them.

Q. Well, so much the better. They are, then, the actual readings which are used by and published by the Texas Railroad Commission, the Railroad Reports?

A. Yes, sir, that is right.

Q. And, of course, those wellhead pressures shown for the years 1935 to 1941 on Exhibits 136-(1) to (10), inclusive, are subject to all of the infirmities which you and I have discussed a moment ago, are they not?

A. Yes, one is quite likely to be one way and one another, so they are probably getting pretty close to the right answer by compensating errors.

Q. But never the true weighted average rock pressures? A. Unless by accident.

Q. Did you determine the rate of rock-pressure decline for the production in wells in Areas "A" to "G", inclusive?

A. You mean by individual wells?

Q. Well, by individual wells or by the average.
[fol. 5896] A. No, I did not.

Q. You had sufficient data, did you not, with which to make a separate determination of the average rate of rock pressure decline per unit of production which actually took place in the five years for each of these areas?

A. Yes, but I didn't have the time for this particular problem.

Q. You would have felt it advisable to do it, if you had had the time?

A. Oh, it would have been a nice check to see how the areas were comparing with the general trend of the field and to see where we might start encountering the sharper decline in these group areas. It would be a check figure.

I would like to have it on all the wells and I hope to be able to make it a part of the well record at some future date.

Q. You could have made a curve from the actual data in the Areas "A" to "G", inclusive, such as that curve which appears in your Exhibit 133, could you not?

A. Yes, that could have been done.

Q. The curves in Exhibit 133 show the story for the entire fields, sweet, sour, east, west and whatever else is included within the meaning of the entire and broad term "Panhandle Field." Is that correct?

A. That is correct.

[fol. 5897] Q. And you could have had that same information in chart form for each of the areas within which

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Panhandle Eastern operates, to-wit, Group Areas "A" to "G", inclusive?

A. I do have such information, except that it is related to years and the withdrawal is shown on an accompanying exhibit rather than having the horizontal scale in M.c.f. to plot the total withdrawal.

Q. Well, but you haven't plotted the five years, 1935 to 1940, from your group areas on any chart so as to determine the rate of production per pound drop in rock pressure, have you?

A. No, I haven't, but I have checked many of them back and found them to run from an indicated content of about 9 million to 126 million per acre and I discarded them because they showed too many fluctuations to be of any value in projecting a line.

Q. Now, I would like to clear up a matter that you and I discussed during cross-examination and that is the manner in which you drew your curve on these pressure-trend charts, Exhibit 136-(1) to (10), inclusive.

Now, if I correctly understand, you are now referring to Group Area "A". You stated that you drew the curve extending beyond the year 1941 in accordance with your judgment. A. That is correct.

Q. And you enumerated the matters that you took into [fol. 5898] consideration. Now, will you state, again, the elements that you considered in drawing that curve, the items that caused you to assume the curve which is shown in Exhibit 136-(1)?

A. I am referring to Group Area "A" and the items which were taken into consideration in the placing of this judgment curve with the type of formation, the number of wells located in the area, the number of remaining locations to be developed by drilling, the rate of withdrawal, the trend of withdrawal and gave an over-all value to the general pressure-trend which I believe will be prevalent in the field.

Q. Now, the first element you mentioned was the "type of formation."

A. That is right.

Q. How did that affect the drawing of this curve?

A. By knowing what the probable migration of gas would be to the formation and that is based upon ob-

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 serving the number of hours required for the pressure build-up after the well has produced like amounts of gas.

Q. How did that element affect the drawing of the curve shown in Exhibit 136-(1)? Did it extend the curve or tend to steepen the curve?

A. It extended it.

Q. Extended it. How far?

A. Well now, I just haven't made any estimate of how far back it would be if we had the same general formation [fol. 5899] condition existing in "A" as we have in "E" and "F", but I would say that it would probably put that back there around 2½ years. That would be my estimate, knowing the withdrawal conditions around that area.

Of course, if we would have had those conditions over in Area "A", then the pressures which are shown on Exhibit 136-(1) would, in all probability, have been some 75 to 100 pounds lower than they are.

Q. Well, if I ask you to draw a curve on that chart, Exhibit 136-(1), taking into account all the elements that you state you considered except the one, namely, the first one that you mentioned, "type of formation," could you do it? A. Yes.

Q. And be exact about it?

A. No, because no judgment curve is exact. Something exact must be governed by mathematics and I don't think anybody else can put it on [their] exact.

Q. You wouldn't want to undertake to do it and say that it was an exact curve when you got through?

A. I would not.

Q. Let's take the second element, "number of wells." How many wells are shown in the chart, Exhibit No. 136?

A. There are 15 owned by the Panhandle Eastern and a total of 98 which are included in Group Area "A".

Q. A total of 98 in Group Area "A"?

[fol. 5900] A. Yes, sir.

Q. All right. How would you have drawn this curve, if there had been half as many wells, let us say?

A. I would have tried to determine at about what years the undrilled wells would have been drilled before I would have placed a curve.

Q. Well, if I ask you to draw a curve on there that would reflect all of the elements of judgment that you

stated you considered, except the element of "number of wells," could you do it accurately?

A. No.

Q. You say you considered the number of remaining locations? A. That is right.

Q. How many remaining locations are there in Area "A"? A. Not very many.

Q. Well, just approximately? A. 33.

Q. Now, could you draw a curve on that chart, Exhibit 136-(1), which would represent all of the elements that you state you considered, excluding, however, the consideration of the number of remaining locations?

A. No, because I would have to go back and determine how much gas was to be taken from the wells drilled, approximately. I would have to get the withdrawal [fol. 5901] trend, is what I mean.

Q. You can't tell us, either quantitatively or qualitatively, the exact amount of weight that you gave to that element, can you? A. No.

Q. You say another element you considered was "rate of withdrawal." Could you draw a new curve on Exhibit 136-(1) that would reflect all the elements except the element of "rate of withdrawal"?

A. Well, if there was no rate of withdrawal and then that curve would just be the number of years behind, the way the field in all probability would go, that it takes the gas to migrate out into areas of withdrawal.

Q. Well, perhaps I should have said if you have varied the rate of withdrawal up or down, 15 or 20 percent, how would that affect your curve?

A. That would affect it in cumulative withdrawal, it would shorten the life if the trend was up, and if it was down it would lengthen the life.

Q. How much would it shorten the life and how much would it lengthen the life?

A. Well, I would say that if the withdrawal in Group Area "A" was half of what it is today in that type formation, it would probably lengthen the life of the field by some three or four years.

[fol. 5902 Mr. Carlton: That is what area?

The Witness: The Group Area "A".

By Mr. Littman:

Q. But you can't be exact about that either, can you?

A. No, sir.

Q. And you cannot tell us exactly how much weight you accorded that element, can you?

A. No, sir, it is a combination.

Q. In the drawing of your curve—

Mr. Wheat: (Interposing) He hadn't quite finished his explanation.

You said it was a combination, of what?

The Witness: It is a combination of all things. If you try to project a curve without putting these all together, why, then you are going to have to be coming back and revising, which you do anyway, in the placing of this kind of a curve.

You think in terms of, now just what weight will that have, and that must be based on judgment.

By Mr. Littman:

Q. Now, you had an element that you call "over-all value to the general trend in the field." What is that?

A. Well, if we would lose sight of the fact that their total withdrawal from the east field is what it has been, why, then we would have an idea that there are areas in the west field that are of less value than they are.

[fol. 5903] We know what the extreme trend in the east field is today. The curvature, the sharper trend of the curve was first noticed in the east field of the Panhandle Field and it was not noticed until after a great amount of gas had been withdrawn from the east field.

Then, the curve started to drop off requiring more pounds pressure to produce the same amount of gas each successive year.

Now, it is starting in the sour field. We know that if it is started in those two fields, that it is going to govern the west sweet field; therefore, as those pressures go down more gas will migrate from the west field into the east field and the west sour field and considerable weight must be given to the over-all picture in the field.

Q. Now, you say "considerable weight must be given" but you can't tell us how much weight you actually accorded the "over-all value" to the general trend in drawing these curves, can you?

A. No, I can't tell you in so many percents, because the weight of the whole field that is given in each of these group areas differs.

Q. Now, as you have stated in your direct examination, the drawing of these very vital and crucial curves,—and when I say "vital and crucial curves" I mean they are vital and crucial in your study, are they not?

[fol. 5904] A. Yes, they are vital and crucial to the life of the Panhandle Eastern Pipe Line Company.

Q. And they were drawn by you, as you have stated in direct examination, by free-hand? A. That is right.

Q. You have no working papers that show us precisely how you arrived at the curvature or course of these curves, have you? A. No.

Q. It is all a matter of what you have termed your "judgment," is it not? A. That is right.

Q. And we have no way to check the precise accuracy of these curves, have we?

A. There is nothing in the testimony about the precise accuracy of these curves.

Q. How accurate are they?

Mr. Wheat: What were you going to say?

The Witness: I say I do not contend that they are precise accurate, but I think that the end of the life of this field is going to find that they are going to approach being fairly accurate curves.

By Mr. Littman:

Q. And neither we nor anybody else has any way of checking your over-all judgment in that regard, have we?

[fol. 5905] A. Yes, you do.

Q. Following your methods step by step?

A. No. All you have to do is to figure out the reservoir required in that field.

Q. But we have no way of tracing your method step by step and determining whether you have accorded the proper weight for all of these component elements that

enter into the drawing of these curves, have we, Mr. Hinton?

A. No. I believe that if you would try to do this problem by straight mathematics, that you could turn over the data in its entirety to a man who did not know the Panhandle Field and the answer that he would get would not even approximate being accurate.

(Discussion off the record.)

By Mr. Littman:

Q. You have used the term "casing head gas" through out your testimony. What do you mean by casing head gas?

A. The wet gas that is produced with oil.

Q. What do you mean by "produced with oil"? From the same strata or from different strata?

A. Well, the true casing head gas comes from the same strata; so-called casing head gas is the gas which is produced with oil that comes from the true gas-bearing formation which does not produce oil.

Q. Well now, certain casing head gas is dissolved in [fol. 5906] oil in its natural state, is it not?

A. Yes.

Q. And you recover it through the casing head along with the oil, do you not?

A. That is right.

Q. Now, there is another kind of gas that is produced by an oil well that is sometimes called casing head gas and that is gas which is produced from a separate strata as dry gas but is produced along with oil which comes from another strata. Is that correct? A. That is correct.

Q. Now, which of these two types of gas have you been talking about when you have used the term "casing head gas"?

A. Only the gas that came from the Panhandle oil and gas bearing formations.

Q. That is the first type which I have described, namely, the type of gas which is dissolved in the oil in its natural state?

A. Yes. After the formations are interconnected by drilling, if the other gas is not shut off, the gas pressure in the oil reservoir will be approximately the same as that in the gas. If I got your question right—

Mr. Culton: (Interposing) He is asking what you included in your withdrawals, I think. Isn't that right?

Mr. Littman: That is right.

[fol. 5907] The Witness: In the withdrawals it is only the metered casing head gas and that amount estimated to be blown into the air and the estimated amount came, supposedly, from oil bearing formation and the other amounts of casing head gas estimated in the early days was given consideration as the total withdrawal from the Panhandle Field.

By Mr. Littman:

Q. Well now, I am referring particularly to the table on Page 10 of Exhibit 42. In that table you show withdrawals from the beginning of the field down to August 1, 1940; do you not?

A. Yes, I am sorry I misunderstood your question. That is all gas produced from the Panhandle Field. It is not any consideration for the gas that was originally stored in the oil reservoir.

Q. In other words, you have not included in those production figures any gas that in its original state was dissolved in the oil and recovered at the casing head?

A. Not unless it was in the same gas bearing formation as the Panhandle Field, the gas field proper.

Mr. Culton: In other words, you have included all types of casing head gas, true casing head gas and so-called casing head gas from the Panhandle Field?

The Witness: Yes.

By Mr. Littman:

[fol. 5908] Q. In other words, the figures do include all gas recovered through the casing head whether it was dissolved in its original state in the oil or not. Is that a correct interpretation of the answer?

Mr. Culton: I don't know whether he understands your question like I understand it or not.

By Mr. Littman:

Q. Suppose you tell us what kinds of casing head gas are included.

A. All kinds.

Q. All kinds of casing head gas are included in your production figures?

A. That come from the Panhandle gas field proper.

Q. In other words, you have included that kind which comes through the casing head from a different stratum than that from which the oil comes?

A. Yes.

Q. And, also, you have included the gas which originally came from the same stratum as the oil came from?

A. That is right.

Q. Even though it was originally dissolved in the oil in its original state, is that right?

A. Yes, that is right. I was thinking about so many different oil pools on the outside of the Panhandle Field proper.

[fol. 5909] Q. I just wanted to make certain as to what you meant when you said that you included all kinds and types of casing head gas.

A. In the Panhandle Field proper.

Q. In the Panhandle Field?

A. Yes.

Q. Well, that is the only field you are talking about or referring to in your table of Page 10 of Exhibit 42?

A. I guess that is correct.

Q. And in your opinion is it proper to include this kind of gas, to wit, the kind that is dissolved in oil in its original state, for purposes of this study?

A. Yes, I think it is.

Q. Do you know whether or not the Railroad Commission of Texas includes that kind of gas in its production figures?

A. Yes, it does.

Q. In its production figures?

A. Yes, the casing head gas is included in the Railroad Commission of Texas, if you will look on the proper page of the Report.

Q. Well, but they talk about it in a separate text, don't they?

Mr. Gulton: It is the same paragraph?

The Witness: No, it is just another column of figures to form the total.

[fol. 5910] By Mr. Littman:

Q. And in your opinion is all casing head gas classed as such by the Railroad Commission? By that I mean all types of casing head gas.

A. Far more so now than previously.

Q. They don't classify certain types or kinds of casing head gas as dry gas or other kinds of gas, do they?

A. Casing head gas is not a dry gas.

Q. I am asking you how the Railroad Commission classifies it?

A. And I answered that they do not classify it as dry gas. That casing head gas comes under one column.

Q. All types and types of casing head gas are referred to by the Texas Railroad Commission as "casing head gas"?

A. Yes, it being divided into two columns, one not treated, blown to air, for the figures used in Exhibit 42.

Q. Now, just one or two questions about capital additions which are set forth in Exhibit 42.

Do you have any authority, Mr. Hinton, to authorize the capital expenditures shown in Exhibit 42 from Pages 21 through 32?

A. No, sir, I do not have the authority to go ahead with those capital expenditures set out on those pages.

Q. In other words, before work can proceed, there must be, first, secured the approval of others in the Panhandle [fol. 5911] Eastern Pipe Line Company?

A. Yes.

Q. Who would have to approve all of these expenditures before they finally are made?

A. A gentleman by the name of Mr. J. D. Creveling.

Q. Anyone else?

A. No. If he approves them, it is all right.

Q. You don't know whether or not it is the practice of the company to have the Board of Directors approve expenditures of this type and character?

A. Well, they are probably submitted to the Board for approval, but the final approval to me comes from Mr. Creveling.

Q. Well, you are not certain whether, as a matter of practice the Board of Directors' consent is required or not, are you? A. No, sir.

Q. What is your authority in the matter?

A. After they have been approved, it is then turned over to me and Mr. Pope, and Mr. Pipe on the matters of production tells me when to proceed with the work.

Q. Mr. Pope is your immediate superior, is he not?

A. Yes.

Q. Well now, you stated, I believe, that all of the capital additions set forth for the first six months of 1941 on [fol. 5912] Page 21 have already been completed.

A. There are a few parts on the liquid separator that have not been installed yet.

Q. But the answer to my question is "yes" with some minor exceptions?

A. Right.

Q. Now, looking at the capital additions which you have set forth on Pages 21 and 22 and 23 for the basic load for the year 1942 and at Pages 27 and 28 for the anticipated load of the year 1942, will you state how much of that work has been actually authorized by the management of Panhandle Eastern?

A. All of it.

Q. Now, you say each and every item has been authorized?

A. There has been no one who told me to take off anything that is included on either of these lists and until they do there is no alteration of these capital expenditures.

Q. What do you mean by authorized? I have been asking you whether they have been authorized and you have been saying yes.

Mr. Culton: You haven't asked him whether he checked it with the management.

By Mr. Littman:

Q. Perhaps we better define what we mean by authorize. Have you been ordered by Panhandle Eastern to go ahead [fol. 5913] with the construction in 1942 which is set forth on these pages?

A. No. It is only about two weeks since the first of the year.

Q. Let's be more specific then. Are there any work orders that have been signed authorizing this work?

A. Yes, the two compressors for Sneed station and the two engines for Hansford.

Q. Just a minute, let's get the items. You are now giving us the items which are subject to existing, signed, executed work orders, are you?

A. I don't know just exactly how many of those orders. I was going to tell you how much material has been ordered to show you about,—I thought you said you wanted to be very specific,—what had been done and I was just going to enumerate the items of material that had been ordered or received to date.

Q. Well, first let me ask you how many of these jobs for 1942 are now subject to existing, executed work words?

A. A work order is not—by "executed" you mean signed?

Q. Signed by the President of your company. He is the man who usually signs your work orders, isn't he?

[fol. 5914] A. No.

Q. Who signs them?

A. The superintendent of each department.

Q. Are you sure about that?

A. Yes. I have never seen one signed by the President of the company.

Q. There is a place on your work orders for the President's signature, is there not?

A. Maybe the copy I get is not the official one, because I don't recall anyone signing anything but a completion work order in our department at all.

Q. Well, at any rate, have you seen any work orders that have been signed by your superintendent,—I will put it that way,—for any of the work shown for the year 1942 under either the basic or anticipated load?

A. No, I have seen nothing more than the signature of Mr. Pope on items to be bought for this work. I have not seen any signed work orders.

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By Mr. Littman:

Q. Now, looking at Item "G" on Page 21, which refers [fol. 5915] to the increasing of the capacity of the gathering line from Zofness to Sneed by looping the existing line between those points and the construction of an addi-

tional gathering lines to serve new wells, has the pipe for that job been ordered?

A. The number of tons of pipe required for that has been given a preference rating with the Priority Board, as I understand.

Q. Well, have you received any of it yet?

A. No, we probably won't receive it until,—we could lay it during the summer months at a much lower cost. If we had received it down there now it would cost us a considerable amount to store it until such time as we got ready to lay it.

Q. Are you sure that you are going to be able to get it?

A. I feel that we are going to because it has a very definite place in the defense industry, the field supply.

Q. Well, you can't be altogether certain about whether you are going to receive it or not.

A. Nobody can be altogether certain about anything this year.

Q. In the way of new construction?

A. That is right.

Q. And so you can't be altogether certain about whether all or any part of these items set forth in your [fol. 5916] list of capital additions in Exhibit 42 will be constructed, can you?

A. No, but I can assure you that Mr. Creveling has had this tonnage figured. I have even done some work on figuring tonnage since I have been here in Washington in order to try to see if we could reasonably expect to get the amount of steel required or if there was any manner in which we would be able to furnish additional gas to the industrial factories making defense products whereby we might use a smaller amount of gas, even though it did not exactly fit in with our contemplated development plans.

Mr. Littman: I think it would be well for this witness to state how far the plans or work has progressed with respect to the items shown for the year 1942, at least.

Mr. Culton: Ask him.

Mr. Littman: And I was going to suggest that perhaps we better do that on Monday. It is one o'clock. It may

give this witness a little opportunity to be better prepared to go right down through the list.

Mr. Culton: Can you do it right now, Mr. Hinton?

The Witness: Yes.

Mr. Culton: Do you need any further preparation?

The Witness: No.

[fol. 5923] Mr. Culton: Mr. Examiner, Saturday afternoon the Examiner suggested that we might be able to get together on Exhibits 142 and 143.

Following out that suggestion Mr. Hinton for Panhandle Eastern and Mr. Dunn of the Commission's staff spent several hours checking all of their computations and late Saturday afternoon reached a full agreement as to the arithmetic of all the figures.

Yesterday Mr. Littman was kind enough to come to his office and go over all of these figures with Mr. Dunn and we are now in full accord with respect to the arithmetic of Exhibits 142 and 143.

I will say that substantially there is practically no change in the figures in which Mr. Littman was interested, between these figures and the figures reflected in his cross-examination of Mr. Hinton earlier in the week and there is practically no difference in this exhibit between Mr. Hinton's figures and those shown in the exhibit, aside from the fact that a weighting was not given to Page 2, on Schedule I of each exhibit as we suggested to the Examiner last Saturday.

In order that it may be more easily understood, we desire to mimeograph one or two pages of each exhibit and during the weekend it wasn't possible to get this done. We will turn it over to be mimeographed today and [fol. 5924] will get Exhibits 142 and 143 in final form.

We will desire to substitute those new sheets in Exhibits 142 and 143 so as not to have a lot of duplication.

Trial Examiner: The conference, to which you referred, yesterday obviated the necessity of further cross-examination of Mr. Hinton, am I to understand, Mr. Littman?

Mr. Culton: There is this further explanation I might make, we are to get, Mr. Littman, some information from the Kansas City office. Mr. Hinton is to prepare that in the form of a letter and send it back to him. I think that should be stated.

Mr. Littman: In answer to your Honor's inquiry, if Mr. Hinton's figures in Schedules 1 in Exhibit 142 and Exhibit 143 had been correct in the first instance, I doubt very much whether we would have had any cross-examination [fol. 5925] of Mr. Hinton on these schedules.

Mr. Culton: You mean, had the average been shown rather than the totals as was suggested at the hearing Saturday.

Mr. Littman: Yes, If the weighted average had been shown.

Mr. Culton: That is right.

* * * * *

I think a statement by me might be in order at this time in order that there will be no misunderstanding at any time with respect to Commission counsel's position on this matter of Exhibits 142 and 143.

I trust that your Honor will grant me the indulgence of making a brief statement and review of the situation.

When Mr. Hinton presented Exhibit 43, particularly the Schedules 3 and 4 of that exhibit which contain his estimate of operation and maintenance costs west of Liberal compressor station for each of the two gas fields, to wit, Panhandle Field and the Hugoton Field, under both the basic-load theory and under the anticipated-load theory, it was obvious to us that unless these total dollar figures were related to the amounts of gas produced and purchased in each of these fields under each of these two theories, they would be without any real significance in this proceeding. In brief, Schedules 3 and 4 merely show Mr. Hinton's estimate in total dollars for each year, for each of the years 1940 to 1946, both inclusive.

As your Honor will observe, there is a steady increase [fol. 5926] in total dollars for each of those years shown in Mr. Hinton's estimate of operation and maintenance costs west of Liberal compressor station in Exhibit 43, schedules 3 and 4.

Now, nowhere in Mr. Hinton's exhibit 43 was there shown the amounts of gas purchased and the amounts of gas produced under each of these bases nor did Mr. Hinton's exhibit or testimony show the amount of money he contemplated would be expended by the company for gas purchased.

In view of that situation I thought it would be well, in fact necessary, to have Mr. Hinton prepare a copy of his working papers showing the breakdown of the amounts of gas purchased and produced. That has been submitted by Mr. Hinton at my request as Exhibits 131 and 132.

I felt it was necessary to interrogate Mr. Hinton with respect to the cost per M.c.f. expected to be paid by Panhandle Eastern for gas purchased in each of the years 1941 to 1946, inclusive.

Now, with that data at hand, it then became very simple to combine the total cost of gas purchased, as contemplated by Mr. Hinton's estimate in each of the future years under each of the two bases with his total estimate of operations and maintenance costs and to take the total of those costs and divide by the number of M.c.f.'s proposed under both bases to be delivered to the Liberal compressor station for each of those years.

[fol. 5927] It then became purely a matter of mathematics to divide the dollars by the total number of M.c.f.'s and secure what we have referred to as a unit cost but which might be more accurately referred to as an average cost per M.c.f. of all gas delivered at the intake side of the Liberal compressor station for each of the years 1941 to 1946, inclusive, showing the average cost per M.c.f. of both gas purchased and gas produced, combined, from both fields under both the base-load theory and the anticipated-load theory.

Now, I read into the record, in order to save time, certain average M.c.f. figures for that purpose, which I asked Mr. Hinton to check. In making that check Mr.

Hinton undertook to make a separation of the average cost as between the cost of gas produced and the cost of gas purchased.

This separation required certain allocations. He, also, produced a breakdown which, to our mind, is wholly immaterial and irrelevant for the simple reason that when we have the total amount of gas produced, purchased and delivered to Liberal under both theories, to-wit, under the basic-load and under the anticipated load, that is all we are interested in.

We are, of course, interested in the average cost of both types of gas, that is the gas produced and the gas purchased, combined.

Now, Mr. Hinton, in presenting Exhibits 142 and 143, showed this breakdown or allocation which was done not [fol. 5928] at our request. As I stated, we were interested wholly in the average total figure for all gas delivered at Liberal.

Now, as your Honor knows, Exhibits 142 and 143 showed in Schedules 1 of each of those exhibits a so-called total average cost for the Panhandle Field and for the Hugoton Field and for the main line.

The record already shows that in order to secure a proper total it would be necessary to weight the amounts against the number of M.c.f.'s produced and purchased in total.

Now, when your Honor suggested that we have a conference in order to determine the mathematical correctness of the average figure, we did just that over the week-end and a member of our staff worked with Mr. Hinton to the end that the correct mathematical average total for the Panhandle, Hugoton, and for both fields combined be introduced into the record and that is the figure in which we are interested.

Now, I simply want it understood beyond any question that our participation in this conference was solely for the purpose of saving time on the record and in order to secure a correct mathematical total average figure.

We do not feel that any allocation as between gas produced and gas purchased is material to the issues in this proceeding. When I say that we worked with Mr. Hinton toward the end that the correct mathematical figure be shown, I would also like to have it distinctly understood, Mr. Examiner, that we do not agree, necessarily, that these are the true average costs. These average costs are all, of course, bottomed upon the validity and accuracy of all of the various assumptions and estimates that Mr. Hinton made.

In other words, they are, in reality, a rearrangement of certain of Mr. Hinton's own basic figures. For example, cross-examination revealed that Mr. Hinton's Schedules 3 and 4 included certain costs taken from the books of the company as the purported cost of fuel.

It is clear on this record that a credit must be allowed for such amounts in order to get at the exact cost.

Mr. Culton: Mr. Littman, don't you think it fair to state that I called your attention to that in connection with your figures and you said that there was no occasion to take that into consideration, because you only wanted to show the general trend and I told you at that time that to get it to a fair basis, that is, to an absolutely accurate basis, we would have to deduct the fuel cost and, also, we would have to divide the M.c.f.'s actually delivered into Liberal rather than the M.c.f. produced and the M.c.f. purchased.

I don't think there is any difference between us.

Mr. Littman: I don't think there is any difference between us. That is why I said that it is clear on the record that everyone is agreed that these totals that we are interested in do show and I am sure they will show this [fol. 5930] when the corrected Schedules 1 are offered for Exhibits 142 and 143 and that is that there is a definite trend downward through the years under both the basic and anticipated load.

I trust that I have made myself clear.

Now, in connection with Mr. Hinton's testimony of capital expenditures, your Honor will recall that I was en

gaged at the close of Saturday's hearing in cross-examining Mr. Hinton on that subject.

Inasmuch as Mr. Hinton's presence was required on the system, we believed that the necessity for recalling him for cross-examination today could be obviated by Mr. Hinton furnishing us a statement for the record which would bring out the things that I had proposed to cross-examine him about this morning.

Mr. Culton was requested by me to have the witness furnish the following data and information with respect to the capital expenditures under the anticipated load which are shown by items in Exhibit 42 from Pages 26 to 32, inclusive.

Here is the information that we would like to have furnished to us in statement form.

Mr. Culton: I am getting more than you requested if counsel want it, I am going into much more detail on that statement than you requested of me.

Mr. Kittman: Don't you think it is well to put on the record what Mr. Hinton is to get?

[fol. 5931] Mr. Culton: Go ahead. I will say "yes" when you get through.

Mr. Littman: We requested the following information by items, that is, by the same items that are listed in "A" to "N", inclusive, on Pages 26 to 32 of Exhibit 42.

First, which of these items are actually in the process of construction? As to those items which are now in process of construction, the progress which has been made to date in that construction.

Secondly, as to those items which are not now in the process of actual construction, we would like to have the following information:

"A" Has a work order been approved and signed by the management authorizing the work to be done?

"B" What materials, if any, are on hand?

"C" What materials, if any, have been ordered and the delivery date on which delivery is expected.

Mr. Culton: Well, now, wait. You didn't give me that. We have ordered it. We can't tell you when we are going to get deliveries under present conditions. You didn't give me the delivery date.

[fol. 5932] Mr. Littman: I was reading from this paper. You see the reason why it is well to put these matters on the records.

Mr. Culton: You didn't say anything about delivery date. I can't tell you when. All our deliveries are for shipment as soon as possible.

Mr. Littman: All I request is, if the delivery date cannot be stated due to the uncertainty of conditions, Mr. Hinton may so state.

Mr. Culton: We will just make that general statement as to all of it, then, when we get through, because you know conditions in the industry now are such that nobody can promise you delivery.

Mr. Culton: The only thing we can say is that we will have ordered all of this for delivery as soon as they can deliver it. That is as far as we can go under the priority situation.

One of the things we are going to give you is the priority orders that we now have. You didn't request it.

Mr. Littman: Suppose you do the best you can, and that is all we can expect anyone to do, with respect to giving us your delivery situation.

[fol. 5933] Fourth, as to any items that deal with pipeline construction we would like to know whether or not the rights-of-way have been acquired.

As you indicated to me yesterday, Mr. Culton, no rights-of-way are required for well lines, of course.

Mr. Culton: You have that in the lease.

Mr. Littman: Yes, but as to the gathering lines.

Mr. Culton: Mr. Hinton is getting that information.

[fol. 5939] C. H. M. BURNHAM a witness, having been previously sworn, resumed the stand and testified further as follows:

[fol. 5940] Cross-Examination (Continued).

By Mr. Littman:

Q. Mr. Burnham, you have heretofore testified on direct examination with respect to Exhibit 47, entitled "Panhandle Eastern Pipe Line Company and Subsidiary Companies—Future Capital Requirements, Gas Transmission Facilities—Liberal Station and Eastward", have you not?

A. I have.

Q. Will you please state, step by step, the procedure followed by Panhandle Eastern Pipe Line Company in undertaking to make new capital additions?

That is to say, what is the first step, and go on through the various steps until the time when the work is actually done.

A. Well, I should say the first step consists of close observation of our load as experienced each winter. That is, the operating organization, knowing the capacity of the system, that is, the calculated capacity, will watch each winter's performance of the then-installed facilities.

Such observation will indicate how much of the installed capacity is being used. Then, by observing the estimate for the following winter—

Mr. Culton: (Interposing) What estimate do you refer to there?

[fol. 5941] The Witness: The estimate of the load to be carried the following winter.

— it is a simple matter to deduce the fact that you are either going to be short or long on capacity.

Now, during the winter of '40-'41, the peak load was in excess of 240 million. The installed capacity at that

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time was approximately 250 million. But, by observing the weather conditions during that winter, it was apparent that the temperatures were above normal on our system, so, by applying a correction factor, we could readily see that had it been a normal winter, we would have used up or needed the 250 million then-installed capacity.

As I stated before, the estimate for the winter of '41-'42 was then given close scrutiny and it was deduced from that observation that in order to protect our customers, more capacity must be installed previous to the coming winter.

That is the winter of '41-'42 I am talking about now.

By Mr. Littman:

Q. Once having decided that, it was necessary to increase the installed capacity of your pipe line system east of Liberal station. What is the next step taken?

A. The next step then consists of making what we call the "flow studies". Those studies are made in the engineering department.

Q. Of which you are the head?

[fol. 5942] A. That is correct, and the load is carried, as I described here in my previous testimony, through a series of computations which will develop the looping required as well as the additional horsepower required in each station, if each station, in that case, is short of power.

Having completed the study, these are then turned over to the management.

Q. When you speak of the management, to whom do you refer, the Board of Directors or certain officers, or both?

A. I refer to Mr. Neuner, Vice President in charge of operations.

Mr. Goodwin: One question, you made reference to having completed the study.

Now, precisely what is meant by the study?

The Witness: The study consists of complete computations showing what pipe and power are required to meet the estimated peak to be experienced during the coming winter.

That is summarized and only the summary is handed over to the management.

Mr. Goodman: Now, that is a routine study?

The Witness: You might call it routine or you might not. It is a very involved and complicated computation.

Mr. Goodman: By "routine", I mean something you do every year.

The Witness: Yes, it is.

[fol. 5943], By Mr. Littman:

Q. Is such a study made for one year in advance or is it made usually for a number of years in advance?

A. It is usually made only for one year in advance, but, in the case of the group of studies that I handed you some weeks ago, it was made, of course, for a number of years in advance.

Q. That is in connection with Exhibit 47?

A. Correct.

Q. And what loads did you use as the basis for the study summarized in Exhibit 47?

A. The loads estimated by Mr. Morton.

Q. And that estimate of Mr. Morton's is contained in Exhibit No. 40, is it not?

A. That is correct.

Mr. Goodman: Does that particular study assume that [fol. 5944] the loads, as indicated by Mr. Morton, will be carried?

The Witness: With certain corrections, yes. We have taken Mr. Morton's load and deducted from it what we call the readily interruptible gas. Then we assume that the balance must be carried.

Mr. Goodman: Now, at what stage in the process and progress of expansion is it determined whether or not the loads as determined by Mr. Morton, will be carried, in other words, whether it is desirable business?

The Witness: Well, I don't know whether I can answer that question or not. Mr. Morton has had in the past a

very uncanny ability to predict the load for the coming winter.

Now, at what stage during this process the management accepts his estimate for the next winter, I do not know.

Mr. Goodman: I do not think you get my question. You are increasing, fairly constantly, the number of your customers. Now, are the arrangements made to increase the number of customers and thus sell more gas prior to Mr. Morton's estimate or subsequent thereto?

Mr. Culton: You mean for new markets, don't you, Mr. Goodman?

Mr. Goodman: Yes.

Mr. Culton: Not additions to existing markets but for new markets?

Mr. Goodman: For new markets, that is correct.

[fol. 5945] The Witness: Well, I should say that, in so far as I know, the contracts for new markets are negotiated and if they are consummated, then Mr. Morton takes them into account in making his estimates of peak loads.

Mr. Goodman: In other words, Mr. Morton does not take in new markets until subsequent to the making of a contract.

The Witness: That is true in cases of large contracts, but Mr. Morton does reflect in his estimate, I happen to know, the normal growth which the property will experience.

Mr. Goodman: Yes, I see.

Now, in connection with large contracts, as you have distinguished it, as distinguished from normal growth, does your department determine the justification for making those contracts?

The Witness: We make no computation in respect to that.

Mr. Goodman: Who does, do you know?

The Witness: I do not know whether any computations are made.

Mr. Goodman: In other words, then, you, as Chief Engineer, tell us now that you do no work in advising the management concerning whether or not it is good business to supply a new market?

The Witness: Well, there are several instances where I have. I will have to retract somewhat on that.

Mr. Culton: You did do it on the Consumers Power deal?

The Witness: Yes, that is the one instance where I did [fol. 5946] advise them and Mr. Morton, I happen to know, made economic studies for these contracts recently entered into in Illinois, Indiana and Missouri.

Mr. Goodman: So, in other words, we are down to the fact that unless you are specifically requested, Mr. Morton's economic studies concerning plant extensions for new markets are the only ones which advise the management on the propriety and profits of supplying the markets?

The Witness: In so far as I know, that is correct.

Mr. Goodman: But Mr. Morton's economic studies are transmitted to you, are they not?

The Witness: For capacity purposes only.

Mr. Goodman: Only for capacity purposes, and the result is that you do not modify those studies or participate in them but pass them on to the management in the form as supplied by Mr. Morton?

The Witness: That is correct.

Mr. Goodman: All right.

By Mr. Littman:

Q. You are the Chief Engineer of Panhandle Eastern Pipe-Line Company, are you not? A. Yes, sir.

Q. Now, Mr. Burnham, will you please continue with your step by step description of what transpires when Panhandle Eastern undertakes to determine whether it [fol. 5947] shall install additional pipe line or horsepower capacity.

A. As I stated before—

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Mr. Goodman: (Interposing) Can I interrupt once again, at this time, because I think it is right along the line.

Mr. Morton has supplied his counsel and his counsel, in turn, has supplied me, with a certain number of estimates, being the total summaries of his economic studies made over the past two years.

Now, subject to the hope that I have them all here, as I think I have, I will hand those studies to you and I will ask you to verify, if you can, whether these comprise all of the economic studies made and transmitted to you by Mr. Morton during the past two years.

Perhaps I had better mark these sheets for identification.

Trial Examiner: Do you care to limit that inquiry to the territory in which you are definitely interested, the Michigan territory?

Mr. Goodman: No.

Trial Examiner: The material, as offered, is, of course, all-inclusive.

Mr. Culton: He has furnished all-inclusive data, I think.

Mr. Goodman: Yes, purported to be all-inclusive, your Honor.

Trial Examiner: These tables consist of how many pages? Do you want to designate the number of pages?

[fol. 5948] Mr. Goodman: I would like to assign a number to the total pages and use a subnumber for each page.

There are 23 pages.

Trial Examiner: This will be marked for identification as Exhibit No. 144, with the component 23 pages being separately marked serially, 1 to 23, both inclusive.

[fol. 5950] (Exhibits Nos. 144-1 To 144-23, Inclusive; Were Received in Evidence.)

[fol. 5951] Mr. Goodman: Yes, I will, your Honor. It will take me a little time, though.

Mr. Burnham, these, consisting of the sheets of Exhibit 144 represent the economic studies which were made by Mr. Morton and furnished you, is that right?

The Witness: I would not say that all of these had been furnished to me. For instance, the letter addressed to Mr. Créveling, I do not believe I ever saw it before. However, in the majority of cases, that is true.

Mr. Goodman: And there is no other work in the nature of economic studies which Mr. Morton has done in the past two years which has been furnished to you, is that right?

The Witness: These consist of all the studies I have knowledge of that he made.

Mr. Goodman: And do these studies originate any of your planning work?

The Witness: I referred to the matter a while ago, that we use these studies for capacity purposes. Now, what I meant by that was that we furnished Mr. Morton the size of the lateral line required to serve these markets as well [fol. 5952] as the estimated cost of such lateral.

Mr. Goodman: And after Mr. Morton makes this study, you proceed to follow [out] your plan for the installation of these laterals?

The Witness: After Mr. Morton has made his study in which he has incorporated estimates furnished him by my department, the study, as I understand it, is then turned over to the management for its decision.

If the decision is favorable, a budget is prepared. The budget is prepared in my department and, after the budget is approved, then we take steps to complete the construction of the facilities required for these particular markets.

Mr. Goodman: Now, is that something independent of your main-line capacity studies?

The Witness: I would say it is independent.

Mr. Goodman: I see, so that at the same time, you are taking care of two types of capacity development or rather of pipe-line development; one having relation to making your mainline capacity applicable to serve the market for the ensuing year, and another dealing with the actual installation of laterals to serve additional markets, is that correct?

The Witness: That is correct.

Mr. Goodman: And are they kept separate?

The Witness: Yes.

Mr. Goodman: Did you ever add them together?

[fol. 5953] The Witness: Mr. Morton adds them when he makes his estimate for the following winter load.

Mr. Goodman: I see.

By Mr. Littman:

Q. Now, Mr. Burnham, will you please continue with your step by step description of the procedure in connection with the installation of capital additions?

A. Concerning the main line?

Q. Of course, your exhibit relates to main lines and compressor stations, does it not?

A. That is correct.

Q. Suppose you give us the details with respect to that and then, if there is any variation from that procedure in respect to other capital additions, you might state what variation there is when you get through.

Mr. Wheat: When you said, "your exhibit", you refer to Exhibit 47, do you not?

Mr. Littman: Yes.

The Witness: Well, as I was about to state, the flow study, summarized with an estimate of the costs involved, is handed the management and it shows the approximate dollars required to expand the plant sufficiently in order [fol. 5954] to carry the load, which load is taken from the estimate furnished by Mr. Morton.

Q. I see. You may proceed with your description.

A. We may not hear from this summary or this flow study for some weeks but, in any event, when the decision does come through, the engineering department is advised to draw up the budget.

Q. Can you tell us what transpires during those two or three weeks? Do you know who looks at these estimates and what action, if any, is taken?

A. In so far as I know, Mr. Neuner takes them up with the New York Office and what goes on in New York, I have no definite knowledge about but, in any event, my department is primarily interested in the answer, whether it is favorable or unfavorable and upon the receipt of the answer, we immediately start the preparation of the budget.

Q. Now, what form does that answer take? Is it in [fol. 5955] writing?

A. Not to my knowledge. Usually Mr. Neuner will advise me by word of mouth to prepare the budgets.

Q. And he returns your estimates?

A. I have a copy of the estimate.

Q. I see.

A. He has, on some occasions, written me with respect to some small projects such as small lateral lines, in order that everyone be advised of the favorable action of the management.

Q. Then what is done?

A. The budgets are prepared.

Q. By you?

A. By my department, under my direction.

Q. Then what do you do with those budgets?

A. The budgets are turned over to Mr. Neuner after they have been properly signed. They are signed by quite a number of the officials of the company in the Kansas City Office before they are turned back to Mr. Neuner.

Q. Then what is done with them?

A. They are sent to New York and Board action is then taken on them.

Q. Then what occurs after the Board of Directors votes favorably upon the particular matter?

A. We are advised of favorable action by the Board and [fol. 5956] if it calls for immediate construction of the project involved, the materials are purchased and steps are taken to let the contracts for the work.

Q. Now, at what stage of this procedure does a work order issue?

A. After the budget has been approved and as soon as some expenditures are about to be made with respect to the budgeted amounts or items, a work order is issued.

Q. Who signs the work order?

A. The work order is issued in the Accounting Department and I do not believe it requires a signature. I say that because I have copies of some and I do not remember that any signatures occurred on them, other than the Accounting officers.

Q. But, at any rate, no work is done until such time as a work order is actually issued, is that correct?

A. Well, in some instances where we know that certain work has to be done where the management has given us informal approval, as you might say, to pursue the engineering work, in that case a work order is issued to cover just preliminary expenses such as drafting and engineering studies.

Q. But I was asking about the actual construction. No actual construction is embarked upon until you first receive the work order?

[fol. 5957] A. (Interposing) No actual work is embarked upon until we receive the work order.

Q. Now, I refer you to your Exhibit No. 47 and particularly to Line 2, which has an item of "Additions to Main Lines" for the year 1941 in the amount of \$4,292,500.

Are all of those lines shown in your map, Exhibit 15, by purple dotted lines?

A. Yes, sir.

Q. Am I correct in stating that all of the work embraced by that item is the looping of the main transmission line?

A. Yes, that is what the title infers, additions to main lines, referring to main-line loops.

Q. And this work was to be done in the States of Illinois, Missouri and Kansas, is that correct?

A. That is correct.

Q. Now, I wish you would please describe for us these lines in greater detail than you have heretofore given. I would like to know, for instance, the size of pipe and the points from which and to which these lines are to run and, also, I would like to know how far along the construction has gone for each of these looped lines.

A. All right.

[fol. 5959] Q. Mr. Burnham, there is a pending question with respect to the item shown in Line 2 of Exhibit 47, "Additions to Main Lines" in the year 1941.

That question asked you to give a description of the various additions included within that description.

A. Do you wish for me to refer to the map in making that description?

Q. Yes, please refer to map, Exhibit No. 15.

A. I believe it is already in the record that the minute that the budgets were approved covering the additions to main line last summer, immediate steps were taken in the way of ordering pipe and preparations were made to let contracts.

Notwithstanding the fact that the orders for pipe were placed rather early in the year, considerable difficulty was encountered in the way of obtaining delivery and, at last, application for a priority number was made to the O. P. M. [Vol. 5960] It was granted early in the fall but too late to permit the completion of these loops which were contemplated.

The work is now in progress and to review briefly I will describe the work as it was originally contemplated and then follow with the description of the status, its present status.

Q. Very well, you may proceed with that description.

A. The only main line loop work which we proposed to do in Kansas was the construction of 10.47 miles of loop line between Haven and Olpe compressor stations.

Q. Now, you are speaking of the 1941 additions to main lines? A. Correct.

Q. What is the size of pipe on that particular loop?

A. This pipe is 26-inch O. D. by 9/32 wall manufactured by the A. O. Smith Corporation and comes in 40-foot lengths.

The work we proposed to do in Missouri was the construction of a loop line between Louisburg and Houstonia compressor stations and it consisted of 10.25 miles of 26-inch pipe of the same specifications as the loop to be built in Kan.

Upon completion of this loop between Louisburg and Houstonia compressor stations, that would mean the completion of two lines between those two stations. In other words, it fills in the gap between the end of the present loop and Houstonia compressor station.

[fol. 5961] Between the Houstonia and Centralia compressor stations we, also, contemplated filling in that gap and it required 15.29 miles of 26-inch pipe to do that work. This, also, is A. O. Smith pipe of the same specifications as the pipe ordered for Kansas.

On the east side of the Mississippi River between Centralia compressor station and Pleasant Hill compressor station in Illinois, there are two gaps that have to be filled, one consisting of 16.37 miles between the two existing loops on the main line between these two stations and the other of 6.7 miles on the east side of the Mississippi River.

These two loops are to be constructed of 24-inch O. D. by 9/32 wall seamless pipe, which will average in length approximately 40 feet.

Between Pleasant Hill and Glenarm compressor stations there is a gap of 24.07 miles yet to be filled which we propose to fill or to construct of 24-inch by 9/32 wall seamless pipe.

Between Glenarm and Tuscola compressor stations we propose to construct 36.03 miles of 24-inch pipe which, when completed, will complete the loops between these two compressor stations.

• Between Tuscola compressor station and Dana measuring station, the terminus of the line, there is a gap of 20.21 miles of line which has not yet been looped. It was [fol. 5962] proposed to complete this looping in the year 1941 under this program.

Q. What is the size of the pipe on the latter loop?

A. It is of 20-inch by $\frac{3}{8}$ wall seamless pipe.

In addition to the loop lines to be constructed there is one river crossing to be reinforced and a second one to be built.

The Mississippi River crossing, as you know, now consists of a line on the Champ Clark Bridge in addition to two 12-inch submerged lines.

We propose to build two more 12-inch submerged lines in order to increase the capacity of this submerged crossing so that in the event that bridge line is lost we will have ample capacity across underneath the river.

This pipe was to be 12 $\frac{3}{4}$ -inch O. D. by $\frac{3}{8}$ wall seamless pipe.

At the Illinois River we have only one submerged crossing today and with the completion of the loops between Pleasant Hill and Glenarm station the need for a second river crossing at the Illinois River is obvious.

It will be constructed of four 12 $\frac{3}{4}$ -inch O. D. by $\frac{3}{8}$ wall seamless pipe line submerged under the river and thoroughly reinforced and weighted for that purpose.

• That, in general, constitutes a description of the work as we originally proposed to do it.

Now, the status of the work I can outline briefly as follows—

[5963] Q. (Interposing) Before you give us the status of the work, will you please state whether or not all of these 1941 main-line additions which you have described are shown on the map, Exhibit No. 15, by a dotted purple line?

A. Yes, they are shown by the dotted purple line paralleling the present main line, except in the case of the Mississippi River crossing where it was impossible to

indicate the two submerged lines which we propose to build there.

Q. Is that line shown on the map? I am referring to the looping in Kansas. A. Yes.

Q. Now, will you please give us the status of the work and I would, also, like to have a breakdown in dollars for each of the items which you have named which go to make up the total of \$4,292,500, as you go along.

A. The loop line in Kansas is commonly referred to as our Haven loop. It is at present under construction. The labor contract was let some weeks ago to the C. F. Foreman Construction Company, a very reliable firm in Kansas City which has been building lines for other pipe-line companies for a number of years.

The pipe has been received and has been strung. The ditching is progressing slowly and, as a result, only two or three miles of pipe have been laid to date.

Mr. Culton: The weather has been cold out there this [fol. 5964] month, has it not?

The Witness: Yes, and I might add, further to complicate the situation the contractor has found the ground underlaid with rock and he is having to shoot practically every foot of the ditch.

The work was further delayed due to the holidays coming in there, it being very difficult to get men to come out over Christmas and New Year's.

With good luck this line should be completed within the next two weeks, in which event our own forces, that is forces of Panhandle Eastern Pipe Line Company, will proceed to tie in the end of this loop to the connections on the cross-over valve at its terminus, in which event we can put it into immediate operation.

The need for that construction was apparent last week during our heavy load and we are extremely anxious to get that loop tied in before the next cold weather arrives.

The total amount of dollars involved in the constructing of this loop is \$338,472.

Mr. Culton: Is that the original estimate?

The Witness: That was the revised estimate.

Mr. Culton: How does that compare with the estimate which was used in arriving at the total of \$4,292,500 in Exhibit 47?

The Witness: That is the amount used in arriving at \$4,292,546.

[fol. 5965] By Mr. Littman:

Q. May I have that figure, \$338,000—

A. (Interposing)—472.

Q. 472. Thank you.

Now, will you please proceed with your statement of the status of the work on the loops in Missouri that had originally been intended to be completed in 1941?

I am taking them in the same order that you gave them a moment ago, Mr. Burnham.

A. I hadn't quite finished with the testimony in regard to the last loop.

There has been a further revision of that estimate and it is somewhat in the other direction, you might say, that is, our last revision of that estimate of that cost is \$326,740.

Are you interested, Mr. Littman, in the revisions that we only recently have made, or do you want me to adhere to the column that adds up to the \$4,292,000 figure?

Q. I would like to have both figures wherever there has been a deviation or revision of the original figure submitted. I think it would be well for you to give the new estimate. Now, the new estimate here is \$326,000—

A. (Interposing)—740.

Q. 740.

A. The next loop, proceeding eastward, is the loop [fol. 5966] which we commonly refer to as the Louisburg loop. It lies near the Houstonia compressor station. The pipe has been received and has been strung. The contractor is the C. F. Foreman Construction Company. There has been no work done other than stringing the pipe on this loop.

Of course, involved in that is the cutting of fences and doing of certain right-of-way work which permits the

trucks to enter the far as and so forth in order to unload the pipe.

The cost of this item was—may I go back to the Haven loop and give the original budgeted amount reflected there?

Q. Yes.

A. The original budgeted amount was \$284,000.

Mr. Wheat: I wish you would give both the other figures, too, right at this time.

The Witness: The first revision of the original budgeted amount was \$338,472. I am talking now with respect to the Haven loop.

The second is \$326,740.

By Mr. Littman:

Q. And it is the \$338,472 figure which is reflected in Exhibit 47? A. That is correct.

In the case of the Louisburg loop the original budgeted amount was \$278,000. The first revision which is incorporated in Exhibit 47 or the effect of which is incorporated in Exhibit 47 is \$316,047 and our latest revision of \$301,900.

The status of the Houstonia loop, I think, is what you are interested in now.

Q. Yes, that is the 10-1/4 miles of pipe?

A. That is correct. The pipe is now arriving on the job for that loop. Incidentally, it would be of interest to you to know that it comes in in quantities of as much as 70 or 80 carloads at a time making it very difficult for the contractor to unload and string it and release the freight cars as promptly as the railroads might wish it to be done, but they are making very good progress in getting this pipe unloaded and I hope they will be able to keep the railroad satisfied as to our efforts to release these cars as soon as possible.

The original budgeted amount on the Houstonia loop was \$453,000. The first revision, the effect of which was reflected in Exhibit 47, was \$440,563.

The second revision is \$453,810.

Mr. Culton: There is an increase in that?

The Witness: Of \$810.

Mr. Culton: I have \$440,000 as against \$453,000.

The Witness: That is correct, but I mean over the original budget.

Mr. Culton: I am talking about those reflected in the [fol. 5968] exhibit. There is an increase of about \$13,000.

The Witness: In that case, yes.

In the Centralia loop, pipe has been shipped and, no doubt, by today some of it has been received.

You understand that all of this pipe has been made. We had word of that last week, ~~that~~ all of it had been turned out the mill.

The original budgeted amount for the Centralia loop was \$609,000. The first revision, the effect of which was reflected in Exhibit 47, was \$632,039 and the second revision is \$626,150.

By Mr. Littman:

Q. Now before you proceed to the next loop line, I wish you would state when you expect these loops to be completed. You gave the date for the first loop which was the Haven loop in Kansas; but you have not stated that fact for the other loops.

A. Well, it entirely depends upon the elements. With good luck, as I said before, the contractor should be able to finish the Haven loop within the next two weeks.

Now, his contract requires that he finish that loop this winter because, as I stated before, we need it badly. If the weather is bad, if the going is too rough he does not have to complete the other loops in Missouri until in the summer.

These contractors can build these loops much cheaper in [fol. 5969] good weather, naturally, than they can in bad weather. For that reason I wouldn't be able to give a very accurate date as to when the other loops will be completed, but I should say that by early summer the other loops will be completed.

Q. And in service?

A. And in service. We will put them in service immediately upon completion.

Q. Now, does that complete your description of the loops in Missouri? A. Yes, it does.

Q. And now you are going to the loops in Illinois?

A. I wanted to make this one remark, though, in connection with this work, that the contractor has assured us that he proposes to work all winter on the Louisburg loop, assuming, of course, that he finishes the Haven loop within the next few weeks.

With that in mind he has placed this pipe in the Louisburg loop on skids to keep it up out of the mud. For that operation we had to pay him a little extra reimbursement.

The first work that we proposed to do in Illinois, that is proceeding eastward from Missouri, is the two 12-inch lines under the Mississippi River. If you don't mind I will talk about them first.

Q. Very well.

[fol. 5970] A. That pipe has been received and is stacked at the nearest railroad siding. The labor contract was let, I believe, last week; if not last week, it was the week before.

The contractor is arranging for dredges to be moved in there immediately and it is proposed to do this work during the winter when dredges are available.

There is evidence that dredges will be at a considerable premium during this coming spring and summer and we thought it wise and agreed with the contractor that he could probably secure the services of a dredging company cheaper during this weather or during the winter than he could later in the year.

It will also interest you to know that the first set of bids on this work were rejected. Some three or four weeks ago they were received and we felt that the proposed prices were much too high.

We rejected all the bids and advertised the work again and these later bids were seemingly the best prices that

we could get and they did reflect some reduction over the first set.

The original budgeted amount of the work to be done on the Mississippi River was \$99,000. The first revision, the effect of which was incorporated in Exhibit 47, was \$141,477.

The second revision which incorporates the new prices at which this contract has been let is \$170,870.

Mr. Culton: In other words, you had to pay nearly twice [fol. 5971] as much for it as the conditions which you had in mind when your original estimate was made would have necessitated?

The Witness: That is true.

By Mr. Littman:

Q. It amounts to \$31,000 more, approximately, than the amount reflected in Exhibit 47?

A. That is correct.

Mr. Culton: I had reference to when they were originally contemplated it was only \$99,000 and that had to be increased nearly \$80,000.

The Witness: The pipe for the Pleasant Hill loop, I believe, has been shipped. This pipe has to be stored along the right-of-way—

Mr. Culton: That is along the general area where the line is going to run?

The Witness: Correct.

(Continuing)—For the reason that our contractor who is building the lines in Illinois has his hands full over here with a long loop between Glenarm and Tuscola and he has indicated to us that he does not propose to work through the winter on account of extremely high costs involved in conducting this work in the winter, so we have agreed that he can store the pipe for the Pleasant Hill loop.

However, we are insisting, though, that he complete a certain section of the Glenarm group which I shall refer to [fol. 5972] later.

By Mr. Littman:

Q. By the way, will you please state when you expect the Mississippi River work to be done?

A. The Mississippi River work will be completed in 60 days.

Q. All right, will you proceed with your description of the Pleasant Hill station?

A. The originally budgeted amount on the Pleasant Hill loop was \$725,000. The first revision, the effect of which was incorporated in Exhibit 47, was \$808,695 and the last revision is \$775,420.

Q. Here is one instance where your latest estimate is approximately \$33,000 below the amount reflected in Exhibit 47?

A. That is correct. We expect the Pleasant Hill loop to be completed sometime in the early summer.

Now, the Illinois River crossing to be constructed lies between Pleasant Hill and Glenarm compressor stations and I shall refer to it now with your permission.

Q. Yes, sir.

A. This consists of a completely new river crossing, as I said before four 12-inch lines are to be built across this river?

Q. Four 12-inch lines?

A. That is correct.

[fol. 5973] Q. Will they all be submerged river crossings?

A. Correct, so that in the event that our original crossing should either be lost or require some maintenance work on it, we will be able to utilize this new crossing to full advantage and maintain service to the east.

The original budgeted amount for the Illinois River crossing was \$101,000. The revised amount, the effect of which was reflected in Exhibit 47, is \$140,863 and the last revision which was made after the contract was let is \$167,160.

Q. That is approximately \$27,000 in excess of the amount reflected in Exhibit 47 for that particular item?

A. That is correct.

Q. When do you expect to complete the work on the Illinois River crossing?

A. That work on the Illinois River will not be finished until some time after the Mississippi River crossing has been completed. I should say that within 90 days from date the Illinois River crossing will be completed.

Q. You have purchased all of the materials required?

A. I forgot to add the pipe is on hand and the situation is similar to that at the Mississippi River crossing with respect to materials.

The next loop is the Glenarm loop which lies between Glenarm and Tuscola compressor stations and where our [fol. 5974] contractor is now engaged.

This contractor is the J. C. Truman Company and has the contract for doing all the work in Illinois with the exception of the river crossings.

The contractor moved into this job shortly before Christmas and was busily engaged in getting started from the Tuscola end of the loop toward the Glenarm end when this extremely cold weather of the recent few weeks set in.

Last week I was informed that the ditch that he had dug was filled with ice and that it would be impossible for him to work until the weather had moderated to the extent that he could get the ice out of the ditch.

This land, as I have stated before, is rather flat land and heavily tiled and the tiles were running with water at the advent of the cold weather. The result was that the ditch froze full of ice from the bottom up as the water came into the ditch, so it is a solid block of ice.

Mr. Culton: How deep is that ditch?

The Witness: About 4 feet.

He had a force of some 175 to 200 men on the job when the bad weather set in and, of course, he has been forced to lay off a majority of these men for the time being.

With good weather he will get started this week and while we are not required to complete the loop this winter we are requiring and specifying in his contract, insisting [fol. 5975] that he build not less than 12 miles of line as soon as possible.

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By Mr. Littman:

Q. This is the 24-mile loop or is it the 36-mile loop?

A. The 36-mile loop between Glenarm and Tuscola.

We have insisted that the 12-mile loop be constructed as early as possible because we need that capacity this winter or we believe we will need it this winter.

The evidence to that end was quite apparent last week when Tuscola station was handling all of the gas that it could possibly handle under the circumstances that then existed.

When the contractor has finished the twelve miles, he can either proceed with his construction on westward or he can sit down until the advent of good weather in the spring. We are leaving that more or less up to him, however; all of the pipe in the Glenarm loop has been placed on skids to keep it up out of the mud in the event that he wants to proceed on westward when he has completed the 12 miles.

I would say that with good weather he will complete the Glenarm loop within 60 days from now. With bad weather he will not complete it until sometime in the early summer.

The J. C. Truman Company has, also, the contract for the Tuscola loop.

Mr. Culton: Will you give us the two prices on that section?

The Witness: I beg your pardon. The original budgeted [fol. 5976] amount for the Glenarm loop is \$951,000. The first revision was \$990,987, the effect of which was reflected in Exhibit 47.

Our latest revision is \$1,980,000.

Mr. Culton: \$1,980,000.

The Witness: That is right—no, \$1,000,980.

The next loop is the Tuscola loop and I started to describe the status of that work.

By Mr. Littman:

Q. Now, this one is the 20.21 miles of 20-inch pipe, is it not?

A. That is correct. As I stated before, the pipe is strung, is on the ground and when the contractor can get to it he will move back to Tuscola and complete that, probably not until the early part of the summer.

The original budget for Tuscola loop is \$443,000, the first revision, which is reflected in Exhibit 47, was \$483,433 and our most recent revision is \$489,780.

The total amount which corresponds to the most recent revision as compared to the \$4,292,500 is \$4,312,800.

Mr. Culton: In other words, you are only about \$20,000 more than your estimate which you testified to in connection with '47?

The Witness: That is correct.

Mr. Culton: On a 4 1/4-million dollar expenditure?

[fol. 5977] The Witness: That is correct.

By Mr. Littman:

Q. Have you completed your description of the additions to main lines for the year 1941, Mr. Burnham?

A. Well, that is the description of the work that we proposed to do in 1941, those additions. Of course, as I have indicated, it now carries over into '42.

Q. Of course none of this work was actually completed in the year 1941 but all of it is now in process of construction, is it not?

A. There were some small items which were completed. I refer to them as small. They cost, maybe, \$10,000 or \$15,000 and it involved preparing each of the compressor stations at Olpe, Honstonia and Centralia to receive these loops as they came into those stations.

Q. But none of that was in service?

A. No, we could not put it in service until the loop was completed, but that was a rather important piece of work. Incidentally, I forgot to tell you that it was executed by another contractor and under the same budget.

Q. Now, will you please explain how much additional capacity will be available by reason of the installation of the loop lines which you have described and which are included in the item on Line 2 of Exhibit 47?

A. That involves the use of storage, supplying gas in [fol. 5978] storage for the capacity increase.

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Mr. Goodman: What storage?

The Witness: Line storage. As you can readily see, on a continuous-flow basis we have not affected the capacity between Liberal and Greensburg, nor have we affected the capacity between Greensburg and Haven nor between Olpe and Louisburg.

By Mr. Lattman:

Q. Those are contemplated to be installed in years subsequent to 1941?

A. That is correct. So on a continuous-flow basis I think it can be stated that we would not have increased the capacity of the system by the construction of the loops which I have just described, however, by taking advantage of the additional storage capacity of these loops and by packing our system during off-peak periods, particularly the east end of our system, the capacity over short periods of time could be and can be materially increased.

Q. Can you give us the figures?

A. We have various estimates, but I should say that we can pack in there some 75 million to 90 million cubic feet of gas which can be made available in not less than three days.

In other words, we don't have compressor capacity to pump it out in any quicker time than three days. For [fol. 5979] instance, if there were 75 million feet of extra storage provided there, for three days' time we could pump an extra 25 million cubic feet per day.

Then we would level off at our continuous-flow capacity.

Mr. Goodman: What was that total figure, again, please?

The Witness: From 75 million to 90 million.

Mr. Culton: In other words, you could furnish for three days additional peak capacity of 25 million a day?

The Witness: That is correct.

Now, if the peak period extended over a number of days exceeding three, why, you would be out of luck. Our experience last week indicated that these peak periods can extend over a period of time greater than three days.

We had a very heavy drag for six days.

By Mr. Littman:

Q. If you will, state why these particular points were selected by you for looping rather than other places that are available for looping?

A. As a matter of fact, east of Louisburg station there are no other places that are desirable for looping.

Q. I am referring particularly to Illinois and Missouri.

Q. I don't need to tell you the advantage of having two lines to any market. That is the reason we selected these points because they complete these loops and give us two excellent lines from Louisburg station to Dana.

[fol. 5980] That is the primary reason. At the same time we will gain capacity which, upon the completion of the loops in Kansas, will be available even on a continuous basis.

Q. I am sorry, I misspoke myself. I had the situation turned around. I meant to say when you will have completed all of your so-called 1941 construction early in the year 1942, you will then have a completely-looped system through the States of Missouri and Illinois. Is that correct?

A. That is correct.

Q. But not in so far as Kansas is concerned?

A. That is correct.

Q. Now, I am wondering why you had selected that particular point in Kansas for looping that short loop that you contemplate completing this year.

A. I believe, as I stated this morning, during peak periods on our system, we observe carefully the operating characteristics of the various parts of our facilities and our observations have been that the Olpe compressor station has had a greater load to carry, that is, its suction pressure was lower than other stations in Kansas.

If you will note, too, the gap between the end of the last completed loop in Kansas and Olpe station is much greater than the gap between our last completed loops in other sections of our transmission system, for instance between Liberal and Greensburg, between Greensburg and Haven [fol. 5981] and between Olpe and Louisburg.

As I was saying, the gap between the end of the loop of the last-built Haven loop and Olpe station is much greater and that would explain the fact that Olpe was starving, you might say, for gas or for suction you might call it more accurately.

Mr. Culton: You have a bottleneck I think you said on direct examination.

The Witness: We have a very slight bottleneck. We knew that we would eventually fill these loops. We knew, too, that we could get some relief for the winter of '41-'42 if we could get that 10 miles completed before the advent of cold weather.

Incidentally, we guessed wrong because cold weather overtook us before we could get it built, but, nevertheless, we may have it completed before the next cold spell this winter, in which event we will be in somewhat better shape at Olpe station to carry our peak load.

By Mr. Littman:

Q. Now, the next item on your 1941 list of capital additions in Exhibit 47 is shown in Line 3 as "Additions to Compressor Stations" in the amount of \$344,100. Is that correct?

A. That is correct.

Q. Now, when you testified here last October 1 believe [Vol. 5982] you stated that this covers the addition of a compressor unit in each of the Illinois compressor stations, namely, Tuscola, Glenarm and Pleasant Hill. Is that correct?

A. That is correct.

Q. And you, also, testified that the work at Tuscola and Glenarm is 80 percent completed and that the work at Pleasant Hill was 60 percent completed. Is that correct?

A. That is correct.

Q. Now, will you bring us up to date on the construction in those compressor stations?

A. The work on all three stations is for all practical purposes completed.

Q. And is it in service?

A. It is in service.

Q. When did it go into service?

A. The Tuscola engine has been in service, I should say, about 30 days. That is the new engine at Tuscola.

The new engine at Glenarm was first put in service approximately two weeks ago and during the extremely cold spell last week we put the new engine at Pleasant Hill in service.

It was indeed fortunate that we had those three engines to place in service.

Q. You had them installed just in time?

A. Just in time.

Q. Now, will you state the additional horsepower at [fol. 5983] each station?

A. The horsepower of the engine at Tuscola is 600, the new engine.

At Glenarm it is 1,000 and at Pleasant Hill it is 1300.

Mr. Culton: How does \$344,100 compare on the final estimate?

The Witness: We have attempted to make no revision, but we feel it is approximately the right figure to use.

Mr. Culton: In other words, work was pretty well along when you made your Exhibit 47?

The Witness: That is correct.

By Mr. Littman:

Q. Now, on the next item which you show in Exhibit 47 for the year 1941, Line 4, "South Michigan North Line" in the amount of \$3,893,300, will you please state what progress has been made in the construction of that line?

Now, before you do that, will you please give us a brief description of that line and state how it is shown in the map, Exhibit 15?

A. It is shown in purple dots on Exhibit 15 as originating here on the Michigan Gas Transmission system just inside the Michigan State line.

It is to be built from that point to the point of junction just west of Ann Arbor. It is to be built of 20-inch seamless pipe. From this point of junction—

Q. (Interposing) Will you give us the mileage of the [fol. 5984] 20-inch pipe?

A. Inasmuch as the surveys on this line were completed since I last testified here, I can give you the revised mileages involved.

Q. Yes, that would be best, to have the latest figures.

A. As I stated before, the system originates on the Michigan Gas Transmission system just inside the Michigan State line and the first section is to be built of 20-inch seamless pipe for a distance of 31.1 miles to a point of junction east of Ann Arbor, Michigan.

Q. Now, that section runs due north, does it not?

A. Not quite due north, slightly to the west, northwest.

Mr. Culton: It so shows on the map, does it not?

The Witness: Yes, as the map indicates.

From the point of junction the north line, as we refer to it, proceeds in a northeasterly direction for a distance of 30.25 miles to a point southwest of Pontiac.

This section is to be built of 18-inch seamless pipe. The north line then proceeds almost due north for a distance of 33 $\frac{3}{4}$ miles to a point northeast of Flint, Michigan.

By Mr. Littman:

Q. What is the size of the pipe in that section?

A. Which section is to be built of 16-inch seamless [fol. 5985] pipe.

From this point the north line proceeds in a northwesterly direction to its terminus west of Zilwaukee. This latter section is to be built of 12-inch seamless pipe. There is a branch line to be built—

Q. (Interposing) What is the mileage on that last section?

A. I beg your pardon. 41 miles.

Q. That is 41 miles from the terminus to the junction southwest of Pontiac?

A. No, it is 41 miles from the terminus of the 16-inch line at a point northeast of Flint to the terminus of the system.

Q. Are you going to talk about the lateral line?

A. Yes.

Q. We will pick that up later.

A. It is still considered part of the north line, I am pretty sure.

Q. I wanted to state that we are going to speak about the Adrian lateral later, but if you have another section of the north line in mind, why, you better go ahead with it.

A. Another section of the north line is that part which runs over to a point south of Pontiac. It consists of 20.73 miles of 12-inch seamless pipe.

Mr. Littman: May I have the last answer, please?

[fol. 5986] (Whereupon, the last answer was read by the reporter.)

The Witness: I believe that completes the description of the north line.

Mr. Culton: Why not endeavor to define the north line to us? Just tell us what point it runs from and the terminus so there will be no question in the record about it. That is later referred to as the "west line".

Mr. Wheat: You say the south Michigan north line and south Michigan west line. I think that is what Mr. Culton referred to.

Mr. Littman: He is going into the south Michigan west line a little later.

Mr. Culton: We just thought that whoever reads the record might, at this time, get the distinction between the west line and the north line.

The Witness: The north line originates on the Michigan Gas Transmission Corporation system and terminates at a point 8 miles west of Zilwaukee. It, also, has another terminus at Clawson which is a point south of Pontiac.

Mr. Culton: And what is the west line?

The Witness: The west line originates at the junction between the 20-inch and 18-inch pipe.

Mr. Culton: On the north line and proceeds westerly to Battle Creek and Kalamazoo. That clears it up, I hope.

By Mr. Littman:

[fol. 5987] Q. Now, will you please state what progress has been made in connection with the construction of the south Michigan north line to date?

A. All pipe, with the exception of a 16- and 18-inch, has been received. The 20-inch has been stacked at points near the right-of-way.

I forgot to add that the right-of-way has been purchased complete. The 12-inch which extends from Flint to the terminus, to the northern terminus of the line has been received and strung and the contractor is now engaged in laying it.

He is working from the northern terminus south. He has laid some 5 or 6 miles completed. He has welded some 20 to 25 miles. This contractor is, by name, I. C. Little and Company. I. C. Little and Company has also been delayed by the advent of the extremely cold weather, however, he is making every effort to complete this some 40 miles of 12-inch into Flint at the earliest possible date, at which time he may elect to continue construction of other lines in the general area.

Q. What seems to be the difficulty with the 16- and 18-inch pipe?

A. There is no difficulty, it is merely a matter of routine operations in so far as the mill is concerned until we will begin to get the 16- and 18-inch pipe.

Q. It has been ordered, of course?

[fol. 5988] A. Oh, yes.

Q. And when do you expect delivery?

A. We expect delivery on the 16- and 18-inch pipe to commence not later than the first of February. The situation is something like this:

The same mill rolled 12-inch that rolled 20-inch. It also rolled 20-inch for the Tuscola loop. It also rolled 24-inch for the other loops in Illinois.

Q. What is the name of that company?

A. National Tube Company. They scheduled their operations in such a way as to take care of our requirements for this coming winter's load.

In other words, we were very eager to get some 24-inch between Glenarm and Tuscola stations, therefore, we told them to roll a 24-inch early in their program. Also, we wanted this 20-inch. This 20-inch here, referring particularly to the 20-inch in Michigan.

The mill said, "Very well, after we finish your 12-inch"—of course we elected to take it first—"We will roll the 20-inch, then the 24 and, having completed all of that, we will then go back and roll the 16 and 18."

Now, they have, according to the latest word we have received from them, completed the 24-inch which was the last to be rolled previous to the 16 and 18, but they advised us that due to certain priorities that had come in, [fol. 5989] the 16- and 18-inch would not be forthcoming for some two weeks.

Q. Am I correct in understanding that all of your rights-of-way had been secured for this south Michigan north line?

A. Well, maybe I was a little optimistic when I stated that. There are, possibly, a few pieces on the lateral line running over to Pontiac not yet in, but everything is completed except that possibility.

Q. And the contracts have all been placed?

A. The contract for all the lines in Michigan, I mean all the lines involved in the north line have been let.

Q. And when do you expect in the ordinary course of events to have completed this south Michigan north line and have it in service?

A. We expect to have it in service, I should say, not later than the first of June.

Q. Now, this line is being built to serve the Consumers Power Company under the Consumers Power contract, is it not?

A. That, in addition to other distribution centers. Adrian, as you mentioned a while ago, was involved, Battle Creek, also, will be served indirectly through this north line.

Q. Has Panhandle Eastern entered into contracts for the serving of those communities that you just named?

A. Yes.

Q. Now, the next item—

[fol. 5990] Mr. Culton: (Interposing) Suppose we check the last estimate on the cost of that line.

The Witness: The revised estimate for the southern Michigan north line, the effect of which was incorporated in Exhibit 47, was \$3,893,300 and our last revision is \$3,424,900.

[fol. 5991] By Mr. Littman:

Q. Mr. Burnham, suppose we take up the next item, which is shown in Line 5 of Exhibit 47 for the year 1941, "Lateral Lines" in the total amount of \$463,800.

Now, if I correctly recall your direct testimony, you stated that the first of these lateral lines was a lateral running to Galesburg, Illinois, which was estimated to cost \$291,500.

Will you please give us the length of that lateral line and the size of the pipe used?

A. The Galesburg line consists of 42 miles of 8-inch pipe extending from a point near Bartonville, Illinois, to the south city limits of Galesburg.

Q. Now, is that line shown on the map, Exhibit No. 15?

A. Yes, in purple dots. In addition to this lateral line to Galesburg proper, is the branch line to Abingdon.

Q. Before going to the Abingdon lateral, Mr. Burnham, am I correct in understanding that the Galesburg lateral involves the lifting of the Mildred, Kansas, lateral to which you referred in your direct testimony and involved the purchase of sufficient additional 8-inch pipe to complete the 43 miles involved?

A. That is correct.

Q. Now, will you state what progress has been made in [fol. 5992] connection with that work?

A. The Mildred line has been lifted and the majority of the pipe lifted from the Mildred line has been received and strung on the Galesburg line.

The balance of the Mildred pipe will be shipped this week.

Q. How much will be shipped?

A. I think there remains about 8 miles to be shipped of the Mildred pipe. The new pipe required to complete the line to Galesburg has been received and is strung on the Galesburg lateral.

Q. What do you say about the original estimate reflected in Exhibit 47 on account of that lateral in the amount of \$291,500?

A. That estimate involved cash expenditures only, that is, I took the cash required to lift the Mildred lateral, added to it the cash required in the purchase of new pipe and added to those two items the cash involved in the labor contract to lay the line to Galesburg.

Q. Have you made any revision of that original estimate?

A. I have not available the revision that has been made but my papers here indicate that a revision has been made which is reflected in my total only on Line 5.

If the Commission would require it, I shall be glad to furnish the details at a later date.

Q. You expect to give us the revised estimate for the [fol. 5993] total shown in Line 5 of Exhibit 47, do you?

A. That is correct.

Q. Now, when do you expect to complete the Galesburg lateral?

A. The contractor is working there when weather permits. He is encountering unusual difficulties due to the extremely cold weather and the depth of the frost.

Like the other two contractors now engaged on our main-line system, he too had to shut down over the holidays and particularly during this very bitter weather that we experienced last week. However, he has assured us and we are working on the assumption that his assurance is worth something that the minute that the weather permits, he will proceed with the work.

He is, nevertheless, proceeding with the stringing of the balance of the pipe to be shipped from Mildred, Kansas. The weather permitting, the Galesburg lateral should be completed by late spring.

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That does not involve the line down to Abingdon, which line is to be built by the same contractor, nor the line to Knoxville.

[fol. 5994] Q. I was going to take those up one at a time.

Let's go to the second lateral included in these 1941 lateral lines, to-wit, the Abingdon, Illinois, lateral. Will you give us a description of that line?

A. The Abingdon lateral originates on the Galesburg lateral and proceeds in the direction as shown on the map southwest for a distance of about 8 miles and consists of a 4-inch line.

It is being built principally to serve the Abingdon pottery or ceramic works there, which is engaged in making products used in the Army camps, and has a direct connection to the war program, as I understand it.

The 4-inch line down to Abingdon will be built after the completion of the 8-inch line to Galesburg. The pipe is on hand, I am glad to state, and will be ready whenever the line is completed into Galesburg.

Q. Now, have you purchased all of your rights-of-way?

A. Yes, all rights-of-way on the Galesburg-Abingdon-Knoxville system are complete.

Q. And the contracts have all been let?

A. The contract has been let. It is one contract.

Q. When do you anticipate putting the Abingdon line in service?

A. It will be put in service immediately upon the completion of the construction, which construction, as I stated [fol. 5995] before, will follow the completion of the Galesburg lateral, so that would probably make it early summer before the service is rendered in Abingdon.

Q. Your estimate of the Abingdon line was \$38,500. Can you state the amount of the revision, if any, since you gave that testimony, or is that also going to be included in your total?

A. That will be included in the total.

Q. But the figure of \$38,500 is correct, is it not?

A. That is correct.

Q. Now, your third lateral is called the Knoxville, Illinois, lateral, which entails a small amount, to-wit, \$2,600; does it not?

A. That lateral consists of only one-half mile of 2-inch pipe and similar to the Abingdon lateral, it originates on the Galesburg line.

It is not shown on the map, being such a short line, but Knoxville is due east of Galesburg and a small community which we propose to serve with natural gas at the same time that that service is rendered in Galesburg.

The construction of that half-mile of 2-inch line does not involve a great amount of work and will be completed [fol. 5996] shortly after the line is completed into Galesburg, which will be late spring or early summer.

Q. Now, the fourth lateral included in the year 1941 is the Greenfield, Indiana, lateral which you estimated to cost \$83,300.

Can you give us the details on that?

A. The Greenfield, Indiana, lateral has been completed and was put in service on January 2. Incidentally, it was placed in service at a time which was most fortunate for the residents of Greenfield.

Greenfield, as you know, has been dependent upon a rather inadequate supply of gas for some considerable time and on the night of January 1 when the cold weather descended upon that area, the boiler at Greenfield gas plant blew up and while we had not put the last finishing touches on the Greenfield lateral line, nevertheless, we were able to turn the gas into the gas holder the following morning and by that means we were able to keep the people in Greenfield, Indiana, in service.

Mr. Goodman: May I ask a question there. Was Greenfield served by manufactured gas?

The Witness: I think I testified here in the previous [fol. 5997] testimony that it was served with manufactured gas and I was wrong in that respect.

It was a local supply of natural gas. I would like to correct my testimony in that respect.

By Mr. Littman:

Q. Will you give us a brief description of that line, to-wit, the Greenfield, Indiana, lateral?

A. The Greenfield, Indiana, lateral originates on the Michigan Gas Transmission system at a point east of Indianapolis and consists of approximately 17 miles of 4-inch pipe which was solid-welded and was laid during the months of November and December.

Q. 1941? A. 1941.

Q. Now, that leaves the last of the lateral lines for the year 1941, namely, the Adrian, Michigan, lateral. Will you give us a description of that lateral line and the status of its construction?

A. The Adrian, Michigan, lateral line is not shown on Exhibit 15 but originates on the 20-inch Southern Michigan north line at a point about midway between the Junction [fol. 5998] with the Michigan Gas Transmission Corporation's line and the junction of the 16- and 18-inch line near Ann Arbor.

The Adrian lateral consists of 7 miles of 4-inch pipe and will be solid-welded. The pipe is at present in stock. That is, it has been received and is stacked near the right-of-way.

The right-of-way has been secured and while the contract has not been let, it is expected that before the 20-inch line is completed, we will let a contract for the construction of the later line to Adrian and work will be commenced on it forthwith.

We anticipate that it will probably be early summer before the Adrian lateral is completed.

Q. Now, you testified in direct examination that the estimated cost of the Adrian, Michigan, lateral, would be \$47,914; did you not?

A. That is correct.

Q. Are you prepared to state whether there have been any changes in the estimate for the lateral lines for 1941

which are included in your Exhibit 47 as shown in Line 5 as \$463,800?

A. Yes, I am prepared to state that while the original budget called for \$463,800 for these lateral lines and the estimate which was incorporated in Exhibit 47 was in the same amount, we have now revised that figure to \$522,700.

[fol. 5999] Mr. Goodman: Does that revision consist simply of cost changes or does it include any figure for additional laterals?

The Witness: It consists entirely of cost changes.

Q. Now, Mr. Burnham, would you please give us your revised estimates for the year 1941 which are shown in items from Lines 2 to 5, inclusive, of Exhibit 47?

Perhaps it would be well to recapitulate the five items shown there.

A. All right. For Line 2 on Exhibit 47, my revised total now is \$4,312,810;

For Line 3, there is no change, that being \$344,100;

Line 4, \$3,424,900;

Line 5, \$522,700 and if I have added them correctly, the total for Line 6 will be \$8,604,510.

[fol. 6000]. The Witness: My first revision was involved in a substantial increase in the cost of all pipe and that was reflected in Exhibit 47.

This last revision has to do with labor costs, primarily.

Mr. Mc Ree: May I ask, Mr. Burnham, did the fact that a larger portion of this work is being done in cold weather affect the costs there?

The Witness: It did, to this extent, for instance, the "skidding" of the pipe to keep it out of the mud and other items like that.

Early in the fall when we originally negotiated these contracts, the contractors did tell us that they would

have to have more money if the work was pursued through the winter. We finally said to them: "Well now, if you will build just a limited number of miles of pipe here and then let it go until spring or until good weather returns, we do not believe you are warranted in asking these increased prices," and we negotiated the contracts on that basis, that is, no increase due to winter construction but we were to keep down our requirements as to the minimum amount of pipe they would lay before the shut-down period.

Now, that pertains to the main-line contractors and to the contractor in Michigan. On the Galesburg line, we [JOL 6001] did reimburse the contractor some extra for working all winter long up there on that lateral and that is probably reflected in the revision that I just gave.

Mr. Mc Ree: You have pressed the contractors a bit more to get the work finished than you anticipated, haven't you?

The Witness: Those particular sections that I mentioned a while ago that were critical in respect to our main lines.

Mr. Mc Ree: Where the defense industries were involved?

The Witness: That is correct.

By Mr. Littman:

Q. Before leaving the 1941 capital additions, I would like to inquire how much additional capacity will have been installed on the system when all of these additions will have been made?

A. I thought I answered that this morning by stating that, in so far as continuous capacity is concerned, we have not built any additional capacity.

Q. I thought my question at that time was confined to the additions to main lines. I am now speaking of the additions to compressor stations as well.

A. The additions to those three compressor stations, by the same token, did not increase the capacity of the system on a continuous basis.

It merely meant that had we had the loops completed which we fully anticipated that we would have, those three

[fol. 6002] additional engines would have made it possible to deliver that storage out of those newly-constructed loops over a reasonable short period of time.

Q. Of about three days?

A. Of about three days as a minimum.

Q. Will you state the capacity of the system?

A. The capacity of the system before we began this work was approximately 250 million cubic feet on a sales basis.

Q. Per 24 hours?

A. Per day, that is correct. It so happened that we did serve, on the coldest day last week, 256 million cubic feet in round numbers.

Q. But you could not keep that up very long, could you?

A. The indications were that we could not keep that up day after day but, for six days, we did deliver through Dana, the estimated capacity of our system, namely, 175 million for 24 hours, which indicated that our calculations on capacity were fairly accurate and, incidentally, on those days, had we been able to carry our entire load, we would have sold very nearly Mr. Morton's estimate for the peak day of this winter.

As I stated before, he has demonstrated an uncanny ability to estimate these peak days accurately.

Q. His estimate for the peak day in 1941 is 240,394 M.c.f., is that correct?

[fol. 6003] A. That was for the winter '40-'41. We have already experienced that peak day.

Q. Then his estimate, as shown in Exhibit 40 for the peak day of 1942, which you say is in reality the peak day for the winter of 1941-1942, is 305,200 M.c.f.?

A. Yes.

Q. Is that the figure to which you just referred?

A. That is the figure to which I just referred, and had we not interrupted our customers which we had to do in several instances and had Detroit, which is shown in that estimate as requiring 143 million—is that correct?

Q. 142 million for Detroit.

A. (Continuing). Had Detroit taken 142 million on that day which it did not due to the operation of its manufactured gas plant, had those things occurred and had we

completed our loops, we would have delivered on that day very nearly 300 million cubic feet.

Mr. Wheat: That was an exceptionally cold spell, was it not, that you had?

The Witness: That was right near the condition that Mr. Morton uses in making his estimates, a zero day, a mean temperature of zero up and down the entire system.

It was indeed fortunate, as I stated before, that we were able to shut off the few industrials that we did. However, it did have repercussions even here in Washington, as I [fol. 6004] understand.

Some of the industries were engaged in work which involved directly or indirectly materials for the Government. However, we attempted to curtail the operations of plants which affected the defense effort to the least extent.

Those plants that were capable of burning other fuels were put on to other fuels. We interrupted on our own system or curtailed on our own system something like 18 million cubic feet per 24 hours.

There were interruptions made in Indiana to the extent of 10 or 12 million cubic feet.

The situation, as I stated before, worked out very fortunately because, at the end of an eight-day period, we were able to resume operations on a 100 percent basis and, to my knowledge, no material was damaged although operations were, in some plants, slowed up to some extent.

By Mr. Littman:

Q. Now, we will go to the 1942 additions. The first item shown is in Line 8, "Additions to Main Lines—\$2,526,900".

You did not, in your direct testimony, state any details with respect to that item. Will you please, therefore, give us a description of the lines that enter into that \$2,526,900 total?

A. This total involves the expenditures required to complete the loops on this system and the need for which

[fol. 6005] has been demonstrated by the experience of last week's cold spell.

The loops to be built are all in Kansas and are shown on Exhibits 15, in these gaps, that is, the gap will show the loops to be built.

Mr. Culton: What color are they?

The Witness: No color. It is merely a gap in our looped system which indicates a loop to be built in our system.

By Mr. Littman:

Q. The white space will indicate the gaps on the map?

A. That is correct. The proposed Olpe loop which will lie between Olpe and Louisburg compressor station is 26.64 miles long and will be built of 26-inch pipe of the same specifications as the 10-mile loop that is under construction now west of Olpe.

The construction will be of similar nature although we do not expect to find as much rock in the construction on the Olpe loop as we do in the construction of the line west of Olpe compressor station.

The Haven loop will complete the gap between Haven and Olpe stations. Had we known that we would be delayed in getting this pipe until just recently that is now being installed in this section of our line, we would probably have pursued this construction all in one piece.

However, the pipe is not available and we will have to wait until later in the summer to get additional pipe to fill [fol. 6006] the gap.

The length to be filled, after the construction of the lines now being built, will be 15.53 miles and it will consist of 26-inch O D, 9/32 wall, A. O. Smith electric weld pipe.

The Greensburg loop to be built in this year will fill the gap between the end of the existing loop and Haven compressor station.

Q. What is the distance?

A. It is 20.19 miles long and will be built of 26-inch O D, 9/32 wall, A. O. Smith electric weld pipe.

The Liberal loop, which is the last on the list, will consist of 23.37 miles of 26-inch O-D, 9/32 wall, A. O. Smith electric weld pipe, and will complete the looping of the entire system.

In addition to the looped lines that I have just described, it will be necessary for the company to make certain changes on the suction side of each of the compressor stations in Kansas with the exception of Olpe compressor station to accommodate this new construction.

In other words, at Louisburg, Haven and Greensburg compressor stations, the company will be required to build connections and install certain necessary valves, and so forth, to make the system adaptable to these new loops.

Q. Does that complete the description of the looped [fol. 6007] lines?

A. Yes. I might say that this totals up to 85.73 miles of 26-inch pipe and; in tons, it is roughly 17,500 tons of steel.

Q. What, if anything, has been done toward constructing those lines?

A. These lines have been surveyed. The rights-of-way have been acquired, practically. In other words, quite a bit of this right-of-way work was done when the original line was built through there.

The agreements, most generally, call for a double line so the right-of-way work merely involves the computation of the roddages and so forth and the mailing of checks in payment for the right-of-way.

The drafting or engineering work has been done.

Q. Has any pipe been ordered?

A. No, no pipe has been ordered.

Q. Will you state what steps have been taken in connection with the securing of the management's approval of this work?

A. We have prepared the budgets and they are in the hands of the Budget Director.

Q. The Board of Directors has not yet approved the work?

A. No, the Board of Directors has not passed upon it.

Q. And no work orders have yet been issued, of course?
[fol. 6008] A. Unless there has been a work order to cover the preliminary work, there have been no work orders issued.

Mr. Culton: By the way, have any of the 1942 budgets been finalized as yet?

The Witness: None of the 1942 budgets has been approved or examined.

If you will pardon me, there have been some slight revisions in the amounts I testified to in the last hearing.

By Mr. Littman:

Q. All right. Let's have your last revision.

A. My first estimate on the Olpe loop was \$764,856.

Q. You did not read those into the record in your direct examination, did you?

A. Line 8, I will testify in regard to Line 8, then. I have revised Line 8 in the amount of \$2,526,900 to \$2,581,160.

Q. \$2,581,160? A. Yes.

Q. Mr. Burnham, I believe when you testified on direct examination you stated that the figures shown in Column B of Exhibit 47 did not reflect increases in material and labor costs subsequent to June 30, 1941, but that they reflected materials and labor costs as of June 30, 1941, is that correct?

A. That is correct.

Q. Now, this new figure that you gave me, what does [fol. 6009] that reflect? What brings about the increase?

A. That increase was brought about by this work which I mentioned a while ago involved on the suction side of these compressor stations to accommodate these loops.

Our experience in building them this year indicates to us that these changes at the compressor stations are much more expensive than we had anticipated.

Q. Does this new amount you just gave reflect any increases in labor costs or materials?

A. Some increase in labor costs but not in materials.

Q. Well, as of what date does this estimate speak, this new estimate of \$2,581,160?

Maybe that would give me the precise answer I want.

A. That is as of December 15.

Q. 1941? A. 1941.

Mr. Culton: That was about the date you prepared your budget estimate for the next year?

The Witness. We are all the time working on this, but that is the date of our last revision or very nearly the date of our last revision.

By Mr. Littman:

Q. And, of course, this sum is subject to revision, that is, either up or down, is it?

A. Indeed it is. However, unless we know that we are [fol. 6010] going to encounter expenditures greatly in excess or quite a bit under the estimated figure, why, we do not change the budget amount.

Q. Now, the next item is shown on Line 9, "Additions to Compressor Stations".

Will you briefly describe those additions in the total amount of \$1,593,900?

A. The experience that we have had of building compressor station additions this summer and the experience we have had during the winter have indicated there should be a slight revision made in the total on Line 9, from \$1,593,900 to \$1,686,990.

That revision reflects increased cost of materials, principally. We, as you know, bought some engines last fall and we learned at that time that prices on engines had materially increased.

In fact, they had increased over any figure that we might have used on June 30, and, as a result, we are revising the estimated costs of building the additions to the compressor stations involved in Line 9.

Q. Now, will you state where these new compressor engines are to be installed and the amount of horsepower involved at each point of installation; and also please state the type and character of machines installed?

A. The total item or total amount involves the cost [fol. 6011] of installing one new 1,000 horsepower Cooper.

Bessemer direct acting gas-engine driven compressor at Glenarm compressor station;

One 1,300 horsepower Worthington unit of similar type at Pleasant Hill compressor station;

Two 1,300 horsepower units, in this case Worthington units of similar type as Centralia compressor station;

One 1,300 horsepower Cooper-Bessemer unit at Houstonia station;

Two 1,000 Cooper-Bessemer compressor units at Louisburg;

One 1,300 horsepower unit at Olpe compressor station, which is a Worthington unit;

One 1,300 horsepower unit at Haven compressor station; and

One 1,300 horsepower unit at Greensburg compressor station, a Cooper Bessemer unit.

Q. Now, will you state the amounts which go to make up the totals shown in Line 9 and which go to make up your latest revised estimate?

A. To install the 1,000 horsepower unit at Glenarm, we originally estimated it would cost \$140,000. We now estimate the cost of this addition at \$175,300.

To install the 1,300 horsepower unit at Pleasant Hill, we originally estimated \$179,400, which estimate has been revised to date downward to \$169,700.

To install the two 1,300 horsepower units at Centralia [fol. 6012] compressor station, we originally estimated \$351,000, which estimate has also been revised downward to \$322,650.

We originally estimated the cost of installing the unit at Houstonia at \$175,500 and we now estimate it to cost \$151,340.

The two units to be installed at Louisburg compressor station were originally estimated to cost \$280,000 and are now estimated to cost \$267,400.

The unit at Olpe compressor station was originally estimated to cost \$156,000 and will now cost, according to our estimate, \$171,810.

We originally estimated the cost of the unit at Haven compressor station at \$156,000 and we now estimate it will cost \$190,000.

We originally estimated the cost to install a unit at Greensburg compressor station at \$156,000 and we now estimate it will cost \$175,290.

The Liberal station, we originally estimated that we would not make any capital additions. However, we find that we are short of cooling tower capacity at this station, and we now estimate that it will require \$63,500 to enlarge our cooling capacity at this station.

Q. Now, am I correct in stating that that latter item for the cooling tower was not originally included in Column B of Exhibit 47, Line 9?

[fol. 6013] A. That is correct, but it is a compressor station investment or capital requirement, the need of which has made itself evident.

Q. Now, am I correct in stating that each of the first figures that you just read into the record go to make up the total of \$1,593,900 shown in Column B, Line 9 of Exhibit 47?

A. That is correct, and if I may add, the total of the last figures or the revisions, add to \$1,686,990 which I gave you a little while ago.

Q. Will this cooling tower replace an old cooling tower?

A. No, it is an addition to the existing tower.

Q. Now, Mr. Burnham, has all of this equipment been ordered? A. It has not.

Q. Has any of it been ordered by the company?

A. None of it has been ordered.

Q. Do you know if any of it has been approved by the Board of Directors or the management?

A. The Board has not passed on any of these budgets.

Q. And, ordinarily, it is the practice for the Board to pass upon items such as these before any final order is placed for them, is that right?

A. That is correct.

Q. Can you state what the probabilities are that such [fol. 6014] equipment could be obtained if ~~ordered this~~ year, considering and having in mind the present conditions of manufacturing materials?

A. The situation is something like this:

There is no question that Panhandle Eastern must have additional capacity built this summer before it can even hope to carry next winter's peak load.

There is no question but what Panhandle Eastern Pipe Line Company serves the defense effort or, if you will, the war effort now that war is here.

• We have been fortunate in the past to secure from the O. P. M. priority ratings which permit us to make extensions to our system and we have every reason to believe that priorities will be granted in the future to permit us to build the needed capacity.

The manufacturers of these engines are, it is true, involved in the production of other materials used in the war effort but, fortunately, the type of engine that we use for gas-compressor work is very dissimilar to anything which might be produced for the Navy or the Army or for other industrial applications.

That would mean that we do not necessarily displace other work in the shops of these big plants and men trained and skilled in the making of these large compressor units continue the work in which they have been engaged in [fol. 6015] producing these big units.

As I stated before, we were very fortunate to get through last week's unusual cold spell as well as we did. However, it did vindicate our judgment and our computations that we have made in connection with the Panhandle Eastern Pipe Line Company's system.

In the first place, it proved that we know how to compute the capacity of our system. We have always felt that we knew how to do that anyway, but the proof like last week's experience is encouraging, nevertheless.

It also shows that our organization is able to predict very accurately the peak days, or peak demands, if you will, that will be placed on our system from time to time.

With those two things behind us, we feel certain that when we propose to the O. P. M. that certain priorities be granted to us, that we can talk with authority and with knowledge in regard to those requests.

Does that answer your question?

Q. What do you say about securing the pipe for the main lines for 1942?

A. As I testified a moment ago, there are about 17,500 tons of pipe involved. That will permit us to complete these loops through Kansas and will increase the capacity of this system more than 50 million per day on a continuous basis.

Q. You mean the installation of 1942 loops?

[fol. 6016] A. Correct.

Q. Plus the additions to compressor stations which you just described will produce that?

A. No, the addition of the loops alone. To show you how important those loops are to this system, the addition of the loops alone would increase our capacity better than 50 million cubic feet per day.

Q. And what do you say about the installation of the compressor stations?

A. The installation of the compressor station additions in conjunction with the completion of the loops will increase our capacity better than 80 million cubic feet per day.

Our figures indicate that the capacity, sales capacity, of the system will be 331 million cubic feet per day after the completion of the loops in Kansas plus the additions to compressor stations as shown on Line 9, Exhibit 47.

Q. Now, you have 250,000 M.c.f. capacity?

A. Right.

Q. And this additional 130,000 M.c.f. would give you a total capacity of 380,000 M.c.f.?

A. I am sorry, but I do not recall mentioning 130,000.

Q. I probably wrote down the wrong figure.

A. Here is what it amounts to: You will get 50 million with loops alone. You will get 81 million with loops and [fol. 6017] power. That is where the difference was.

Q. I see. The 80,000 M.c.f. is cumulative?

A. That is right.

Q. And that will give you a total of 330,000 M.e.f. capacity?

A. Correct.

Q. As of the date on which these additions that you have described have been installed?

A. Yes, more nearly 331 million.

Mr. Goodman: That is constant capacity.

The Witness: That is constant capacity.

Mr. Goodman: And that takes no account of the increase made on the 1941 or contemplated for 1941 of 75- to 90 million, three-day capacity?

The Witness: That takes no account of line storage. Now, as I have indicated before, line storage is an uncertain thing to rely upon so we much prefer and have always, in the past, based our computations and our studies on continuous capacity.

[fol. 6020] C. H. M. BURNHAM a witness, having been previously duly sworn, resumed the stand and testified further as follows:

Cross Examination (Continued).

By Mr. Littman:

Q. Mr. Burnham, yesterday we completed our discussion of the additions to main lines and additions to compressor stations shown in Lines 8 and 9 of Exhibit 47, which additions are shown in that exhibit for the year 1942.

We will now pass on to the next item shown in Line 10, namely, "Additions to Gasoline and Dehydration Equipment", in the amount of \$120,000.

Will you give us a description of that equipment?

A. Before going on to that statement concerning Line 10, additions to gasoline and dehydration equipment, I would like to say something in respect to the main line additions that I testified to yesterday.

Q. You mean for the year 1942?

A. Yes, and for 1941. I wanted it distinctly understood that those expenditures concern only the main line

east of Liberal and I think the record will show that to be the case.

Q. Yes.

[fol. 6021] A. I mentioned certain tonnages of pipe involved. I do not include in those tonnages any pipe required for field operation.

As you can readily understand, in so far as this hearing is concerned, this witness is not trying to cover pipe and compressors required other than between Liberal and Dana, Indiana.

Q. And you do include Liberal in your estimates?

A. I do include Liberal compressor station itself.

Q. Mr. Hintop has testified with respect to the capital additions west of Liberal?

A. That is correct.

Q. And that would take in all of the gathering lines and other line additions which you state you are excluding from your testimony?

A. That is correct.

The \$120,000 item shown on Line 10 as being required in the year 1942 for additions to the gasoline and dehydration equipment involves the purchase and installation of two complete absorption towers and dehydration contactors, one new boiler, the necessary pipe, valves and fittings to install this equipment, certain buildings and miscellaneous expenditures totaling \$120,000.

This investment, as you know, is at our Liberal gasoline and dehydration plant.

[fol. 6022] We have not revised the estimate so it stands as I originally testified earlier this winter.

Q. What do you propose to accomplish by these additions to the gasoline and dehydration equipment?

A. As more gas is carried through the main line system, it follows that more gas is brought into Liberal compressor station. It is necessary, therefore, to increase the capacity of our gas treating plant.

This plant removes natural gasoline which would otherwise condense in the line and at the same time removes water vapor, which, if left in the gas, would give us no end of trouble, particularly during cold weather.

Q. What will be the capacity of your gasoline and dehydration plant at Liberal compressor station after the installation of these capital additions in the amount of \$120,000?

A. The capacity of each absorber-contactor is approximately 40 million cubic feet per 24 hours at 500 pounds working pressure.

Therefore, the addition of two new ones will increase the capacity of this plant by some 80 million cubic feet per day. The present capacity is in the order of 275 million per day.

Q. That would bring your total capacity to 355 million cubic feet per day?

A. That is approximately correct.

Mr. Culton: That would be a peak?

[Tol. 6023] The Witness: For peak-day operation. Yes.

By Mr. Littman:

Q. What is the type and character of this equipment?

A. It is the usual type of equipment that is used by all natural gasoline plant operators.

Q. Who manufactures this new equipment?

A. The equipment itself is made by various manufacturers. The absorber-contactor towers are built, in this case, by the Stearns-Roger Manufacturing Company of Denver, Colorado, but this type is also available from other manufacturers inasmuch as it is not a patented device.

The boiler, of course, is a water tube type boiler with brick setting. The pipe, valves and fittings are similar to those already installed in this plant.

I did not mention the fact that a great part of the equipment needs to be insulated after it is installed.

Q. Has this new equipment been ordered?

A. No, it has not.

Q. What stage has been reached in connection with this estimate?

A. We have done very little work in connection with this installation inasmuch as the engineering work, to a

[fol. 6024] great extent, involved in making this addition will be done by the contractor. It is, in fact, a more or less specialized piece of work which various contractors skilled in the art are engaged to conduct.

I will mention three firms that we do have on our list that are engaged in this kind of work. The first is the Fluor Corporation of Los Angeles, California; the second is the Stearns-Roger Manufacturing Company, Denver, Colorado; and the third is J. F. Pritchard of Kansas City, Missouri.

Q. Has any action been taken by the management or Board of Directors of Panhandle Eastern with respect to this proposed addition to the gasoline and dehydration equipment?

A. No action that I have knowledge of.

Mr. Culton: Is this a necessity, though, if additional lines are constructed so as to handle the additional gas?

The Witness: That is correct. I might add that while I have not had time to revise this estimate, our experience in the early part of this month indicated that not only is the absorber-contactor capacity going to be deficient for next winter's load but we are also faced with the necessity of increasing our distillation capacity at the same time.

As I stated before, I have not had time to go into that and no doubt certain recommendations will be made by the engineering department to the management too, at the same time, increase the distillation capacity of this plant.

[fol. 6025] As you can readily understand, we have learned a lot about our entire transmission system in the last ten or 12 days.

Q. Going to the next item, which is shown in Line 11 as "South Michigan West Line", in the amount of \$1,766,000, will you give us a brief description of that line and please refer to the map, Exhibit No. 15.

A. The west line as shown on Exhibit 15 originates at the junction of the 20-inch and 18-inch north line pipes.

Mr. Wheat: You mean the south Michigan north line that you described?

The Witness: Yes, sir, and proceeds in a westerly direction to the City of Kalamazoo. For a distance of 64.5 miles, the line is to be constructed of 16-inch pipe.

This pipe will be seamless pipe and will be solid welded.

By Mr. Littman:

Q. That 16-inch pipe will run from the junction with the south Michigan north line as far as—

A. (Interposing) Battle Creek.

Q. Battle Creek, Michigan, is that correct?

A. Correct. From Battle Creek to Kalamazoo, the line is to be built of 12-inch seamless pipe, solid welded and, according to our latest survey, the distance is 19.5 miles.

We are now engaged actively in securing the rights-of-way for this line, as well as for the lateral lines connecting [fol. 6026] to the towns of Jackson, Marshall and Battle Creek.

I would estimate that about 20 to 30 percent of the rights-of-way have already been secured. The pipe is on order. None has been received and, as I testified yesterday, we anticipate that it will be rolling in in the next two or three weeks.

Mr. Wheat: What do you mean "rolling in"?

The Witness: Coming in on the railroad.

By Mr. Littman:

Q. Has the contract been let for that line?

A. No, the contract has not been let for that line.

Q. I assume from what you have said that the Board of Directors of Panhandle Eastern has formally approved the building of this so-called south Michigan west line?

A. Yes, the budget has been approved.

Q. Work orders have been issued?

A. Yes, work orders have been issued.

Q. Now, this line will serve new markets, that is, markets heretofore not served by Panhandle Eastern?

A. That is correct.

Q. And generally, those markets include the cities of Jackson, Michigan; Marshall, Michigan; Battle Creek, Michigan, and Kalamazoo, Michigan?

A. That is correct.

Q. Are there any others?

[fol. 6027] A. The outlying villages and towns already connected to the distribution systems originating in those towns that you just named.

Q. Which of these cities are now served by Consumers Power Company?

A. Jackson and the outlying towns; Marshall and the outlying towns, and Kalamazoo and outlying towns.

Q. What arrangements have been made with the distribution company serving Battle Creek?

A. The contract has been entered into covering service to Battle Creek, Michigan.

Q. What is the name of the distributing company there, do you know?

A. Battle Creek Gas Company, I believe it is.

Q. What revision, if any, have you made in your estimate of that line since you last testified in this proceeding?

A. The original budget called for an expenditure of \$1,504,000. The figure I testified to here in the fall was [fol. 6028] \$1,766,000. That has been revised to \$1,719,480.

Mr. Culton: The contracts have not yet been let?

The Witness: No.

Mr. Culton: Therefore, it is subject to revision either way as the contract price may require?

The Witness: That is correct.

By Mr. Littman:

Q. Are there any further details that you can give us with respect to the South Michigan West Line that would be enlightening?

A. Yes. The 12-inch pipe required to build the section between Battle Creek and Kalamazoo has already been delivered and is stacked along the right-of-way at strategic points.

Q. When do you expect to have this new South Michigan West Line in service?

A. The South Michigan West Line should be completed by the late summer of 1942.

Q. Now, the next item shown in Exhibit 47 is "Telephone Line East" in the amount of \$522,800, which appears in Line 12. What is the status of that proposed capital addition?

A. There has been no further work done on that estimate.

Q. Has there been any work done on it?

A. None other than the estimate that was reflected in my working papers. Of course, you understand that at the [fol. 6029] moment it is difficult to get copper and this line will require copper so it follows that if that work is done this year, it is quite possible that the cost will be revised, probably primarily due to the increased cost of copper and to increased cost of labor and so forth which we are feeling the effect of now in connection with other work.

Q. But at the present, you have made no revision of your original estimate which appears in Column B of Exhibit 47 in the amount of \$522,800?

A. No, I have not.

Q. Now, you testified in your direct examination that you contemplated extending the present telephone system across the States of Missouri and Illinois in connection with the looping program, is that right?

A. I stated the fact that when the loops are complete from Louisburg station eastward to Dana, that it will be necessary to establish a better communication system than is now existing between our eastern stations and the main office at Kansas City.

Q. You have a complete telephone system, do you not, in Kansas? A. Yes.

Q. And in Texas?

A. That is correct and it connects with each and every station, each and every warehouse at various strategic [fol. 6030] points in the field and to the Kansas City office.

We are in complete communication at all hours of the day with the system from Louisburg station west, including both fields.

Q. Both gas fields? A. Correct.

Q. But you do not have a telephone system in the States of Missouri and Illinois, is that correct?

A. That is correct.

Q. And this capital addition comprehends the completion of that telephone system, is that correct?

A. That is correct.

Q. Are you depending now on commercial telephone and telegraph-lines for your service in the States of Missouri and Illinois?

A. Yes, we are.

Q. Now, with respect to this item for "Telephone Line East", has the management approved the estimate?

A. The estimate has been discussed with the management. I cannot say that it has been approved because it has not been presented to the Board. We look to the Board for approval of the budgets, you might say.

Q. And that approval has not yet been given?

A. No, it has not.

Q. Will it be necessary to acquire certain rights-of-way in connection with the building of this line?

A. Yes, indeed.

Q. And those have not been undertaken?

A. No, sir.

Mr. Culton: Just a moment. In that connection, your rights-of-way for the pipe line give you the right to use a telephone line right along the pipe-line right-of-way?

The Witness: In many instances, but there are cases in Missouri and Illinois where that provision was not written into the pipe line right-of-way contracts.

We also probably will be able to lease pin space on other telephone lines.

Mr. Wheat: You mean the usual joint-pole operation with other companies operating pole lines in the vicinity?

The Witness: That is correct.

Mr. Culton: Pardon me, Mr. Littman, one further question. In the event Panhandle Eastern succeeds in obtaining the Michigan Gas Transmission Company, will that resulting situation be of any importance in connection with this telephone line matter?

The Witness: Indeed it will, because if we attempt to operate that line from our present headquarters, it will be necessary that we build the telephone line on through

the States of Indiana, Ohio and Michigan to the city gate of Detroit.

On the other hand, if an office is maintained in Detroit [fol. 6032] or at some other point on the Michigan Gas Transmission system, that office, in turn, will have to be in close contact with our Kansas City office and with the field operations.

Mr. Culton: Is that for the purpose of keeping proper pressures along the entire line?

The Witness: That is true.

I do not care to make any statement in connection with the way these two properties now are being operated, and I do not want that to be construed as being the way they should be operated if separate.

Mr. Culton: Suppose, if there is no objection, that you tell us what has to be done in order to maintain the pressures from one end to the other, just what the problem is and how the problem is to be handled?

The Witness: We have what you call a gas dispatching office at Kansas City. The chief dispatcher makes certain observations on the then-existing load on our system.

The weather predictions he has telegraphed to him and various information concerning the estimates of requirements of customers on the system and through his experience, he is able to determine if there is need for more gas to be turned on in the field and if pressures should be raised over the system or at certain points on the system.

The dispatcher then issues certain instructions to the various compressor stations and to the field headquarters.

[fol. 6033] These instructions are to indicate whether or not more gas is to be turned on or off, or whether or not the pressures are to be raised or lowered.

Mr. Culton: Right there, does he have a chart showing what the pressures are at all the various points on the system during the day?

The Witness: He has a complete tabulation of the pressures which have been reported to him, not only during that day but all of the days previous on the western end of our system.

Those pressures are called in over our company-owned telephone system every hour and on the east end of the system, including some points on the Michigan Gas Transmission system, the pressures have been telegraphed in in a staggered form so that we have information every hour but not every hour for each and every station.

The effect of his order is watched carefully to see that the pressures do respond in the manner that he has contemplated and the deliveries through various points of measurement are also observed.

Mr. Culton: One more question. Suppose those pressures do not respond regularly.

The Witness: Then he takes what he considers the necessary additional steps—

Mr. Culton: (Interposing) To find out what is wrong?

The Witness: To find out first what is wrong and to correct [fol. 6034] the same.

Early this month, we had the unusual experience of interrupting certain industrial customers that had never previously been interrupted or curtailed.

Mr. Littman: You are referring to industrial customers?

The Witness: That is correct, and the dispatcher and his staff were busy day and night keeping track of the load and its response to increased pressures, decreased deliveries to certain industrial customers and to like matters.

By Mr. Littman:

Q. The next item is shown in Line 13, "Lateral Lines", in the amount of \$254,200.

Now, that line is the lateral which you contemplate building to Bloomington, Illinois?

A. That is correct.

Q. Does it include any other lateral?

A. No, sir.

Q. Where is it proposed that this lateral line shall connect with the main line?

A. The proposed Bloomington lateral line originates on the Peoria lateral and at a point on the Peoria lateral, due west of Bloomington, Illinois.

The line proceeds eastward for a distance of some 29 miles to the city gate and it is to be built of 8-inch pipe.

[fol. 6035] Q. What stage has been reached in the construction of this line?

A. In so far as I know, we have done no further work or had no further negotiations involving the construction of this line.

Q. In other words, you have not yet passed the estimate stage?

A. No, we have not.

Q. Now, this proposed lateral line will serve a new market of Panhandle Eastern after it is built?

A. That is correct.

Q. Namely, Bloomington, Illinois?

A. That is correct.

Q. Does Panhandle Eastern Pipe Line Company have a contract with the distributing company at Bloomington, Illinois?

A. A contract has been under negotiation and, to my knowledge, has not been consummated:

* * * * *

Q. Have you any revised estimate for this lateral line?

A. No, I have not.

Q. Strictly speaking, the item should be "lateral line" rather than "lateral lines", should it not?

A. That is correct.

Q. The next item is the warehouse shown in Line 14 as [fol. 6036] "Warehouse Paola", in the amount of \$7,500. Will you give us a brief description of this item?

A. The present warehouse has become inadequate for our purposes and it is contemplated that during this year we shall not only remodel the present warehouse but shall extend it to some extent.

We propose to use the old foundation and to provide ourselves with more convenient quarters by the expenditure of some \$7,500.

There has been some drafting work done in connection with this, although the budget covering this item has not been yet approved.

Q. Has not yet been approved by the management?

A. That is correct.

Q. Now, this warehouse is located in Miami County, Kansas, near the Louisburg compressor station?

A. Yes, sir.

Q. I take it from your testimony that the plans and specifications for the improvement of the Paola warehouse have not yet been fully completed?

A. They are fairly well completed but, as you say, not fully completed.

Q. Before leaving the items shown for the year 1942, I would like to go back to one or two of the items in that year. What do you think the probabilities are that you [fol. 6037] will be able to secure the necessary copper wire for the building of this "telephone line east"?

A. I have no definite knowledge as to the availability of copper wire. I have read in the newspapers where certain restrictions are being placed on the purchase and sale of copper, but other than that, as I stated before, I have no exact information.

Of course, in an emergency or in an unusual situation, the line might be built of steel wire. However, copper is much preferred.

Q. Now, referring again to the proposed additions to gasoline and dehydration equipment as you have already indicated, the expenditure of the sum of \$120,000 for the year 1942 will substantially increase the capacity of the gasoline plant at Liberal station, is that correct?

A. That is correct.

Q. Now, that will enable you to produce more gasoline?

A. Yes, we will produce an increased quantity of gasoline, provided we make this addition to our distillation unit; which, as I testified a while ago, was badly needed, corresponding to the increased quantities of gas which we

anticipate may come into the Liberal station due to the increased load.

Q. And that will substantially increase the revenues derived from the sale of that gasoline?

A. Depending on the price of gasoline at that time, [fol. 6038] there will be an increase in revenue.

Q. Well, you naturally would expect an increase in those revenues, would you not?

A. Yes, I believe that is a reasonable assumption.

Q. But you cannot state how much?

A. No, I cannot.

Mr. Goodman: Have you made any estimate, either you or in your department, as to the expected revenues from your gasoline plant operations?

The Witness: We have made no studies nor estimates as to the revenue, to my knowledge.

Mr. Goodman: Have you made an estimate of the quantities of gasoline which will be derived?

The Witness: We know, roughly how much gasoline we can extract from gas produced in the Hugoton Field and gas produced in the Texas Panhandle Field.

Mr. Goodman: What are those quantities?

The Witness: The Texas Panhandle runs in the order from 350 to 400 gallons per million cubic feet. The gas in the Hugoton Field, as I remember, runs in the order of [fol. 6039] 300 gallons per million cubic feet.

By Mr. Littman:

Q. Now, Mr. Burnham, do you expect all of these capital additions which you have set forth under the heading for the year 1942 to be installed in that year in the light of present conditions and bearing in mind that when you first submitted this estimate, you did so some months ago?

A. Yes, I do.

Q. You still expect each and every one of these items to be installed this year? A. Yes, I do.

Q. Now, is that a reasonable expectation or is it a hope on your part that they will be installed?

A. As you just previously stated, bearing in mind that there may be some difficulties getting materials; bearing in mind that some of these contracts, particularly the contract for the Bloomington line may not be consummated, I believe that it is a very reasonable assumption that we shall do all this work in the year 1942.

That is, all based on the fact that during the past few weeks, it was demonstrated in no uncertain way that we do need these main line additions and we do need the additions to our gasoline and dehydration plant; that we do need the telephone line east or will need it.

It is also to be remembered, too, that a great deal of this [fol. 6040] work is already under construction. That particularly concerns the items shown under the year 1941.

Q. But does not refer to the items shown in the year 1942 with the exception of the South Michigan West Line?

A. That is correct.

Q. That is the only item for 1942 involving actual construction at this time?

A. That is correct.

Q. Now, passing to the items shown for the year 1943, the first which is shown in Line 17 is "Additions to Compressor Stations" in the amount of \$3,482,800, will you state the nature and description of these contemplated additions, their locations and amounts for each?

A. The looped lines will have been completed by the fall of 1942 and, therefore, additional capacity can be made available in 1943 by the installation of more compressor units in various compressor stations up and down the system.

The expenditures in 1943 as shown in Line 17, involve the installation of two 1,300 horsepower Worthington gas engine driven compressors at Tuscola compressor station;

Two 1,300 horsepower similar units—

Q. (Interposing) Will you please give us the amounts as you go along, or would it be more convenient for you to give those later?

A. The total amount has not been revised, so I would [fol. 6041] much prefer to refer to the total. However,

I do have the details of each one here if you wish to have them read to you.

Q. Yes, I think we ought to have the amounts for each if you are able to give them to us.

A. They are in my working papers that you handed me yesterday, so I will have to refer to them.

The estimated cost of the addition to Tuscola compressor station is \$364,000.

Q. Now, that includes the cost of the equipment plus the cost of installation?

A. Including also the cost of extending the building; extending the cooling tower; installing the necessary pipe, valves and fittings to accommodate these two new units.

Q. Wherever the work involves the extension of the building and so forth, I wish you would please state it as you go along.

A. Very well.

As I was about to state, the work to be conducted in 1943 involves the installation of two similar units as those to be installed at Tuscola at Pleasant Hill compressor station.

In addition to the installation of the two 1300 horsepower compressor units at that station, the building must be extended; the cooling tower enlarged; the necessary pipe, valves and fittings installed.

[fol. 6042]. The total cost of the addition to Pleasant Hill station is estimated at \$358,800.

Centralia station is the next station on the system that must be enlarged to take care of the increased requirements for the winter of '43-'44.

Three 1300 horsepower units will be required at this compressor station involving, among other things, an extension to the building; the enlargement of the cooling tower; the total cost of which is estimated at \$526,500.

Q. Did you state that these compressor engines were Worthington engines? A. That is correct.

Q. What type of engines are these?

A. The engines are twin tandem horizontal engines direct connected to the compressor cylinders.

Q. That is true of all the engines involved in the 1943 construction? A. That is true.

Q. Will you please proceed with your description?

A. At Houstonia station, we shall require the installation of two 1300 horsepower Cooper-Bessemer gas compressor units of similar type to those mentioned in connection with the three eastern stations.

The installation of these two units at Houstonia will involve, of course, the extension of the main building; the [fol. 6043] extension of the cooling tower; the installation of various valves, fittings and certain pipes. The cost is estimated at \$351,000.

At Louisburg station, the increased load to be experienced will require the installation of two 1000 horsepower Cooper-Bessemer units and will involve also the extension of the main building; certain additions to the cooling tower equipment as well as changes in the pipe, valves and fittings.

We estimate this cost at \$280,000.

At Olpe compressor station, we shall have to install three 1300 horsepower Worthington units.

Q. What horsepower?

A. Three 1300 horsepower, making a total of 3900 horsepower and which will involve an addition to the main building; an addition to our cooling tower equipment; and changes in the yard piping, involving the installation of a considerable quantity of new pipe, including valves and fittings.

Q. What is the amount?

A. I beg your pardon, the total amount which we estimate will be required at Olpe compressor station is \$487,500.

At Haven compressor station, we shall require the installation of three 1300 horsepower Cooper-Bessemer units which will also involve a substantial addition to the main building; an increase in our cooling tower capacity, as well [fol. 6044] as the installation of certain valves, pipe and fittings to accommodate these three new units.

The total cost of this addition is estimated at \$487,500.

At Greensburg compressor station, there will be installed three 1300 horsepower Cooper-Bessemer units involving a substantial addition to the main building, to the cooling tower, and to the existing yard piping. The total cost of this addition is also estimated at \$487,500.

At Liberal compressor station, one new 1000 horsepower Cooper-Bessemer unit will be required. The main building will be extended and certain additions will be made to the cooling tower equipment as well as to the piping and valves in the yard. The total cost of this addition is estimated at \$140,000.

I believe that the sum of the figures that I have just testified to give us the total on Line 17, namely, \$3,482,800.

Q. Yes. These are the only additions for the year 1943 which would affect the capacity of the system, is that correct?

A. Assuming that the gas will be made available at Liberal compressor station, that is correct.

Q. Now, what do you expect to be the capacity for 24 hours of your system after these 1943 capital additions are installed?

[fol. 6045] A. We shall have a peak day sales or delivery capacity of 355,800,000 on a 24-hour basis.

Mr. Culton: That would give a little leeway on Mr. Morton's estimate of 343 million. In other words, you will be on the safe side for his 343 million peak in 1943?

The Witness: I think you should refer to his 1944 peak. The 1943 peak that he has estimated will occur during the winter of '42-'43.

Mr. Culton: Would you still be able then to take care of his peak in 1944 of 367 million?

The Witness: We designed for Mr. Morton's peak after having deducted certain readily interruptible gas.

Mr. Culton: After taking care of the interruptible, you will be able to take care of the 367 million?

The Witness: That is correct.

By Mr. Littman:

Q. You testified yesterday, Mr. Burnham, that the installation of the capital additions set forth in Exhibit 47 for the year 1942 will bring your total 24-hour capacity to 330,000 M.c.f.

Now, do I understand that the addition of all of this compressor station equipment and additions for the year 1943 will only raise that an additional 24,800 M.c.f. per 24 hours?

A. That is correct, with the possible exception that the record shows that we will have, at the end of 1942, a capacity of 331 million rather than 330 million.

Q. In other words, the expenditure of \$3,482,800 for additional compressor station equipment and facilities for the year 1943 will raise or increase the 24-hour capacity of the system by 24,800 M.c.f.?

A. That is correct.

Q. What stage has been reached in the construction of the additions to the compressor stations set forth in your Exhibit 47 for the year 1943?

A. They are only in the estimate stage.

Q. Have those estimates yet been submitted to the management?

A. Only in so far as the papers and estimates in connection with this rate case have, of course, been available to the management.

Q. The next item for the year 1943 is, "Additions to Gasoline and Dehydration Equipment". Will you give us a description of that item?

A. That item involves the new distillation unit in regard to which I was testifying a moment ago.

We are debating whether or not that distillation unit should be installed in the year 1942 rather than in the year 1943 so the money there involves the distillation unit referred to previously as well as the necessary additional contractors and the increasing of our pumping equipment at [fol. 6047] the gasoline and dehydration plant, as well as other necessary changes involved in taking care of the increased quantities of gas which must necessarily be treated in this plant.

Q. Has this item passed the estimate stage?

A. No, it has not.

Q. And the estimates have not yet been submitted to the management except for rate-making purposes?

A. No, I would say that it has gone a little farther than that. We have discussed the matter very seriously with Mr. Neuner, Vice President in charge of operations.

Q. But it has not yet been submitted to the Board of Directors for approval?

[fol. 6048] A. No, it has not.

Q. Now, going to the year 1944, you show in Line 24 of your exhibit 47, an item entitled, "Additions to Main Lines" in the amount of \$6,228,600. Will you give a description of those main lines?

A. This item reflects the beginning of the construction of the third line or loops which will ultimately constitute a third line.

Our flow studies indicate that, starting at the east end of our system, we shall not need to do any looping east of Glenarm compressor station.

However, between Pleasant Hill and Glenarm stations, we shall be required to install 10.85 miles of 26-inch O. D. by 9.32 wall pipe at a cost of \$30,000 a mile, amounting to \$325,500.

Between Centralia and Pleasant Hill compressor stations, we shall be required to install 22.64 miles of 26-inch pipe at an estimated cost of \$679,200.

Q. Are these distances which you are stating the total distances between the two compressor stations?

A. No, they are only the lengths of the new loops which will be built alongside the then-existing two lines which new loops will give us an increase in capacity sufficient to carry the anticipated loads of the winter of '44-'45.

Q. Will you designate on the map the point at which [fol. 6049] each of these loops will start and terminate?

A. As I just stated, we shall require no looping east of Glenarm compressor station to carry the estimated load. However, the load does require certain additions between Pleasant Hill and Glenarm stations and the new loop will start at Pleasant Hill compressor station.

That is the Pleasant Hill loop that I referred to a moment ago and will proceed eastwardly for a distance of 10.85 miles where we now have a main line gate valve installed with the proper interconnections which will make it possible to tie in the end of this new loop and to put it into operation immediately upon the completion of that construction.

That new loop, as I have just stated, will permit the transportation of additional quantities of gas between Pleasant Hill and Glenarm station which additional quantities will be required, according to our studies.

Q. How much additional gas will you be enabled to transport between Pleasant Hill compressor station and Glenarm compressor station by the addition of this 10.85 miles of 26-inch pipe?

A. In round numbers and giving consideration to the fact that we are going to put in another 1000 horsepower unit here at Glenarm compressor station during that same year, approximately 20 million cubic feet per day.

Q. Now, will you give us the same information for the [fol. 6050] Centralia loop?

A. The Centralia loop will originate at Centralia compressor station. It will proceed eastward for a distance of 22.64 miles, paralleling the existing double line out of that station and will be tied in at its eastern terminus to a now-existing main line gate valve and upon completion of that construction will be put into operation immediately.

The effect of building that loop between Centralia and Pleasant Hill will increase our capacity in round numbers, as I stated before, some 20 million cubic feet per day.

Q. And the estimated cost of this particular loop is \$679,200? A. That is correct.

The next loop that will be required will be between Houstonia and Central compressor station and will originate at Houstonia compressor station and will proceed eastward for a distance of 27.25 miles where it will be tied in to the existing double line and will thereby increase our capacity, in round numbers, between 20 and 25 million cubic feet per day.

Q. What is the estimated cost of that line?

A. The estimated cost of that line is \$785,182.

Q. Will you give us the next one?

A. The next loop which we will require will be a relatively short one and will lie between Louisburg and Houstonia compressor stations.

Q. What is the estimated cost of that line?

A. The estimated cost of that line is \$261,139.

Q. What is the estimated increase in capacity between Louisburg and Houstonia compressor stations by reason of the building of that loop?

A. The capacity will be increased, considering the fact that we will install some additional power at Houstonia compressor station during the same period, in round numbers, between 20 and 25 million cubic feet per day.

[fol. 6052] Q. Will you proceed with your description of the additions to main lines for the year 1944?

A. The next loop required lies between Olpe and Louisburg compressor stations. It involves the construction of 23.7 miles of 26-inch pipe at an estimated cost of \$680,451.

Q. What additional amounts of gas will the installation of this loop enable you to carry?

A. In round numbers, approximately 25 million cubic feet.

In this loop there is involved a new river crossing at the Neosho River some ten miles east of Olpe compressor station. We propose to build in this new river crossing four 16-inch submerged lines.

The total length of the river crossing is 3.42 miles and its cost is estimated at \$209,988.

[fol. 6053] The next loop to be built lies between Haven and Olpe compressor stations and involves the construction of 41.02 miles of 26-inch pipe line.

This loop will originate at Haven compressor station. We will cross the Arkansas River a short distance from the station and it will be tied into the existing double-line system at a terminus some 41 miles east of the station.

The total cost of this loop is estimated at \$1,263,621.

Involved, also, in this loop is a new river crossing at the Arkansas River. It will be constructed of four 16-inch submerged lines, the distance from header to header being 1.13 miles.

The total cost of this river crossing will be \$69,382.

The next loop lies between Greensburg and Haven compressor stations.

Q. Before going to the next loop, will you please state the amount of additional gas that will be enabled to be transported between Haven and Olpe stations by reason of the new loop?

A. The additional gas will be in the order of 30 million cubic feet per day.

The next loop to be constructed will lie between Greensburg and Haven compressor stations and will consist of 34.36 miles of 26-inch pipe.

It will originate at the Greensburg station and will proceed westward and will be tied in at its terminus into the existing double-line system.

The total cost of this loop is estimated at \$1,013,606.

Q. And what is the additional amount of capacity by reason of this loop?

A. Roughly the capacity will be increased by approximately 30 million cubic feet.

The next loop to be constructed will lie between Liberal and Greensburg compressor stations and will involve the construction of 31.82 miles of 26-inch pipe line at a cost of approximately \$940,535.

This line will originate at Liberal compressor station and will proceed eastward for the distance mentioned where it will be tied into the existing double-line system. The increase in capacity which will result from the con-

struction of this loop will be approximately 30 million cubic feet per day.

Q. Does that complete your item shown in Lane 21 of Exhibit 47? A. It does.

Q. Will you go to the next item which is shown in Lane 22, "Additions to Compressor Stations" for the year 1944?

A. During this year it is possible to take advantage of some of the power that we estimate will be installed the previous year.

[fol. 6055] In other words, we are balancing the pipe on these loops against the power previously installed and it will be necessary to build only three compressor station additions during the year 1944.

Q. Now, where will those be built? Please give us a description of the additions.

A. Starting at the east end of the main line system, we shall install at Glenarm compressor station one 1000 horsepower Cooper-Bessemer gas compressor unit involving an addition to the main building, the extension of our present cooling tower equipment and the addition to certain piping in the yard.

The total cost of such addition we estimate will amount to \$140,000.

At Houstonia compressor station we shall install one 1300 horsepower Cooper-Bessemer gas compressor unit.

Q. And what is the estimate for that item?

A. We estimate the total cost will be \$175,500. It involves in addition to the installation of the 1300 horsepower unit an extension to the main building and certain additions to our cooling tower and to the piping in the yard.

The next compressor station addition proceeding westward is that of a 1000 horsepower Cooper-Bessemer unit at Liberal compressor station involving, among other things, the extension to the main building, the extension [fol. 6056] of the present cooling tower and certain additions to piping in the yard. The total cost of these additions is estimated at \$140,000.

Q. Now, that completes the estimated additions for the year 1944. I presume that none of this has passed the estimating stage, has it? A. That is correct.

Q. And none of it has been submitted to the management? A. That is correct.

Q. Who requested you to make the estimates for the year 1944 which are shown in your Exhibit 47 in Lines 21 and 22?

A. I don't recall what individual requested me to do that, but I do remember that it was my assignment when the studies were undertaken.

Q. When did you first undertake to make your estimate for the year 1944, approximately?

A. In the month of September.

Q. Of 1941? A. Correct.

Q. Had you ever previously made an estimate of capital additions for the year 1944? A. No, sir.

Q. Is it customary for you or your department to make estimates that far into the future? A. No, sir.

[fol. 6057.] Q. What is your customary practice in that regard?

A. The customary practice is to make these estimates one year in advance of the required construction.

Q. That is, in the normal course of events, you, as chief engineer of the company, make estimates of capital additions for approximately one year in advance?

A. That is correct.

Q. Were you advised of the purpose of these estimates, which extended beyond the year in advance?

A. I beg your pardon?

Q. Were you advised of the purpose for which this estimate shown in Exhibit 47 was to be prepared?

A. Yes, I think I knew the purpose.

Q. What was the purpose?

A. The purpose was in order to present the data to this Commission during this rate hearing.

Q. And for this rate proceeding? A. Yes, sir.

Q. Now, am I correct in understanding that none of the estimates of capital additions for the year 1944, which are shown in your Exhibit 47, have been submitted to the management of Panhandle Eastern for construction purposes? A. That is correct.

Q. And it is, also, true of the amounts shown for the [fol. 6058] year 1943? A. That is correct.

Mr. Culton: Those have all been discussed with the President and Vice President, have they not?

The Witness: Yes. As I mentioned a moment ago, the management is familiar with our requirements through the future years due to their having examined these papers and so forth.

By Mr. Littman:

Q. And your statement to the effect that the estimates of additions have not been submitted as yet to the management of the company for construction purposes would apply to those set forth for the remaining years, to-wit, 1945 and 1946? A. That is correct.

Q. Before going to the year 1945, I wish you would state the amount of additional capacity which will result from the installation of the capital additions shown for the year 1944 in Lines 21 and 22 of Exhibit 47.

A. The capacity will be increased by approximately 25 million cubic feet per day. When I say "capacity" that means the sales or delivery capacity.

Q. Inasmuch as you have previously testified that as of the end of the year 1943 you would have a 24-hour capacity of 355,800 M.c.f., the increase resulting from the installation of the 1944 additions would result in a total [fol. 6059] capacity as of the end of 1944 of 380,800 M.c.f.?

A. That is approximately correct. The figure that I have used is 380,450 M. c. f. I am referring to the study that was made when it was determined that these loops and compressor station additions would be required in the year 1944.

Q. Now, in Line 25 you show an item for the year 1945 of "Additions to Main Lines" in the amount of \$6,329,600. Will you please describe the additions embraced by that item?

[fol. 6060] A. Starting at the east end of the system, the first loop to be constructed will be between Tuscola station and the terminus of the line at Dana, Indiana.

It will originate at the discharge side of the Tuscola compressor station and will extend eastward for a distance of 14.72 miles and will be constructed of 26 O. D. by 9/32 wall, electric weld pipe.

Q. What is the estimated amount of that section?

A. \$441,600.

Q. What is the estimated increase in capacity between Tuscola and Dana by reason of the installation of this third loop?

A. Between 40 million and 50 million cubic feet of gas per day.

Q. What is the next one?

A. The next loop to be constructed in the year 1945 lies between Glenarm and Tuscola compressor stations and will consist of 17.08 miles of 26 inch 9/32 wall, electric weld [fol. 6061] pipe and will extend from the discharge side of Glenarm station eastward for the distance mentioned where, at its terminus, it will be tied into the existing double line system.

The total cost of this loop will be \$512,400. The additional capacity, considering power to be installed in both Glenarm and Tuscola stations, will be in the order of from 40 million to 50 million cubic feet per day.

The next loop will be constructed between Pleasant Hill and Glenarm compressor stations and will consist of 25.61 miles of 26 inch pipe line involving a total cost of \$768,300 and will result in an increase of capacity in the order of 40 million to 50 million cubic feet of gas per day.

Q. Where does this line begin and where does it terminate?

A. The Pleasant Hill loop to be built in the year 1945 will originate at the eastern terminus of the Pleasant Hill loop constructed the previous year.

Q. Which is a point 10.7 miles east of Pleasant Hill?

A. That is correct.

Q. And where will it terminate?

A. 25.61 miles east of the eastern terminus of the loop constructed the previous year.

I think I was wrong in saying that it began—did I mention the fact that it had begun at Pleasant Hill compressor station?

[fol. 6062]. Q. Will you please go to the next loop for the year 1945?

A. The next loop will be between Centralia and Pleasant Hill and will consist of 22.51 miles of 26-inch pipe line construction and will cost \$675,300.

It will begin at the eastern terminus of the loop line constructed the previous year and will extend eastward for the distance just mentioned where it will be tied into the existing double-line main line system.

The increase in capacity will be in the order of 50 million cubic feet per day.

The next loop to be constructed will lie between Houstonia and Centralia compressor stations and will involve the building of 12.16 miles of 26-inch by 9/32 wall pipe line at an estimated cost of \$350,378.

Involved in this loop will be a new river crossing at the La Mine River, consisting of four 16-inch solid-welded submerged lines extending for a distance of 1.15 miles from bank to bank or, rather, from header to header, costing \$70,610. The increase in capacity involved or resulting [fol. 6063] from the construction of the Houstonia loop in connection with other loops and power to be installed will amount to approximately 50 million cubic feet per day.

The next loop to be constructed in the year 1945 will lie between Louisburg and Houstonia compressor stations and will involve the installation of 22.57 miles of 26-inch pipe at an estimated cost of \$695,856.

It will commence or begin at the eastern terminus of the Louisburg loop built the previous year and extend eastward for the distance just mentioned, where it will be tied into the existing double-line system.

The increase in capacity resulting from construction of this loop in combination with the other loops to be constructed and power to be installed during the same year will be in the order of 50 million cubic feet per day.

The next loop to be installed will lie between Olpe and Louisburg compressor stations and will consist of 23.69 miles of 26-inch pipe line.

Its cost is estimated at \$680,164. The construction on this loop will commence at the eastern terminus of the 26-inch loop built the previous year and will extend eastward for the distance just mentioned at which point it will be tied into the existing double-line system.

The increase in capacity resulting from the construction of this loop in combination with other loops and compressor [fol. 6064] station additions will approximate 55 million cubic feet per day.

The next loop to be constructed will be between Haven and Olpe compressor stations. It involves the construction of 24.24 miles of 26-inch by 9/32 wall pipe from the eastern end of the loop built the previous year and extending for the distance just mentioned to a point on the existing double-line system where it will be tied in and in combination with the other loop built during the same year and compressor station additions installed will result in an increase in capacity approximating 55 million cubic feet per day.

Q. What is the estimated cost of that line?

A. The estimated cost of the loop just referred to is \$746,713.

The next loop involved in the 1945 construction program lies between Greensburg and Haven compressor stations and will consist of 23.15 miles of 26-inch pipe line extending from the eastern end of the loop built the previous year.

At its terminus it will be tied into the existing double-line system and the capacity of the system resulting from the installation of this loop in combination with other loops and compressor station additions will amount to approximately 55 million cubic feet per day.

It is estimated that this loop will cost \$680,934.

The next loop lies between Liberal and Greensburg stations [fol. 6065] and will be 23.93 miles long. It will, also, be constructed of 26-inch by 9/32 wall pipe at a cost of \$707,323. The capacity increase resulting from the construction of this loop in combination with other loops built the same year, as well as compressor station addi-

tions added, will result in an increase of capacity of approximately 55 million cubic feet per day.

Q. Now, the 55 million cubic feet figure which you have just given applies to the additional capacity which will result from the installation of the main lines and compressor stations shown in Lines 25 and 26 of Exhibit 47 under the year 1945? A. That is correct.

Q. And that would bring your total capacity as of the end of 1945 to 435,450 M.c.f.?

A. Well, I am sorry, but in working this increase in sales capacity back toward the west end of our system I have mentally added a small amount to cover compressor station fuel.

If you will note, I started off stating that our capacity on the east end of the system will be increased in the order of 50 million and, as I worked backwards, down the system I added a small amount for fuel.

I might give you the total figure which represents the sales capacity which will result from the building of all [fol. 6066] these loops and the compressor station additions in regard to which I am about to testify.

The total sales capacity or delivery capacity in the year 1945 at the completion of the construction program for that year will be 429,900 M.c.f.

Q. That is an increase of 49,450,000 cubic feet over the previous year's capacity?

A. That is correct.

Q. Now, the next item shown for the year 1945 is "Additions to Compressor Stations", in the amount of \$627,500. Will you describe those capital additions?

Mr. Goodman: Before you answer that question, if I may interrupt, I require some clarification here as to what you mean by your figures for total sales capacity.

I wonder if you don't mean the maximum day?

The Witness: The sales capacity, of course, is involved with maximum day.

Mr. Goodman: In other words, that is the figure for your maximum day delivery capacity. That is what you mean, isn't it?

The Witness: That is correct, on a continuous basis.

Mr. Goodman: I understand. That is all.

By Mr. Littman:

Q. Well, Mr. Burnham, Mr. Morton estimated in Exhibit 40 that the peak day requirement for the year 1945, [fol. 6067] which means the winter of 1944, is 392,450 M.c.f.

Now, you will have installed, as of the year 1945, 429,900 M.c.f. Is that correct?

A. No, I cannot agree with you. Mr. Morton's peak day estimate of some 392,450 cubic feet is his estimate under the year 1944 and that is the peak day which will be experienced in the winter of 1943.

Wait a minute. It occurs under the column "1945" and that will be the peak day experienced during the winter of 1944-1945.

Q. That is shown in column "G" of Exhibit 40, is it not?

Mr. Wheat: Isn't it a fact that during the year 1945 you have to prepare for the peak of the winter 1945-1946?

The Witness: That is the correct answer, you might say.

Mr. Wheat: And that is why you would necessarily during the calendar year 1945 raise your capacity to a greater amount than is shown on Exhibit 40 of the Witness Morton in Column "G" under the heading "1945" which means the winter of 1944-1945. Is that true?

[fol. 6068] The Witness: That is correct.

By Mr. Littman:

Q. In other words, if I correctly understand your testimony, you are installing capacity by way of additions to main lines, compressor stations and so forth in the year 1945 in order to meet Mr. Morton's estimate shown in Column "H" of Exhibit 40 for the year 1946, to wit, 441,900 M.c.f.?

A. That is correct.

Q. It doesn't look like you are going to meet it, does it, according to this estimate of 429,900 M.c.f. which you stated was going to be the total sales capacity installed by your capital additions through the year 1945?

A. Mr. Morton's estimate of the peak day is high in the sum of 12 million cubic feet of gas which we consider as readily interruptible.

In other words, it is being sold to industrial plants that can use other fuel and for that reason we do not design capacity to carry such a load as that over the peak day periods.

You will find that true for each of the winter periods that I have just been testifying to.

Q. In other words, your capital additions are installed with a view to meeting the non-interruptible gas, that is, the household gas, industrial and domestic requirements of the system and not the interruptible industrial load?

A. More properly it might be defined as not the highly [fol. 6069] or readily interruptible industrial load. We have industrial contracts with industries which are now engaged in the manufacture of material made for war purposes and we do not consider them highly interruptible although the contract does permit the interruption or curtailment of supplies of gas to these industries.

Now, therefore, we have in these studies reflected the effect of interrupting only those industries which can readily change over to some other form of fuel.

[fol. 6070] Q. Mr. Burnham, you have not given us the description of the additions to compressor stations for the year 1945 shown in your Exhibit 47 in Line 26 in the amount of \$637,500.

Will you please proceed to give us a description of those additions?

A. In addition to the looped lines which we will be required to build in 1945 in order to carry the increased demands we expect to have made on this system, we shall install at Tuscola compressor station one 1300 horsepower

Worthington gas engine driven compressor at a cost of \$182,000.

Q. This cost will include an extension to the main building in addition to the cooling tower and certain additions to the year piping.

At Glenarm compressor station—

Q. (Interposing) What is the additional capacity contemplated to be brought out by the installation of that one [Ex. 6071] 1300 horsepower Worthington compressor engine?

A. As I testified this morning, in combination with the loops to be built the same year and in combination with additional units to be installed in three other compressor stations, our capacity will be increased, that is, sales capacity will be increased approximately 50 million cubic feet per day.

Q. Will you proceed with the next item of compressor station additions for the year 1945?

A. At Glenarm compressor station, we shall install one 1000 horsepower Cooper-Bessemer unit and, at the same time, extend the main building and make certain additions to the cooling tower and yard piping.

The total cost of this addition is estimated at \$140,000. In combination with loops built the same year and certain additions made to other compressor stations, the increase in capacity will be in the order of 50 million cubic feet per day.

At Houstonia compressor station, we will be required to install in 1945 one 1300 horsepower Cooper-Bessemer compressor unit at an estimated cost of \$175,500 which figure includes the cost of extending the main building, extending the present cooling tower and building certain additions to the existing piping system in and about the compressor station. The capacity increase—

Q. (Interposing) You do not need to repeat that each [Ex. 6072] time. What you have heretofore said would apply to each of these, would it not?

A. That is correct.

Q. With respect to the increase in capacity?

A. That is correct.

At Louisburg compressor station, we will install one 1000 horsepower Cooper-Bessemer compressor unit at an estimated cost of \$140,000.

This cost included the investment involved in extending the main building to accommodate this new unit and making certain additions to the cooling tower and yard piping.

Q. Proceed with your description of these compressor stations.

A. That is the extent of the compressor station additions which we estimate will be required in the year 1945. I am now referring, of course, to compressor stations east of Liberal station, including Liberal station itself.

Q. Are there to be any additions to the Liberal station in this year of 1945?

A. No.

Q. Now, I note, Mr. Burnham, that in the preceding year 1944, you expect to install one 1300 horsepower Cooper-Bessemer engine at Houstonia and that you plan to do the same thing in the next year, that is, in 1945. Is that correct?

[fol. 6073] A. That is correct.

Q. - And in each of those years, you extend the building and rearrange the piping and so forth in order to accommodate the installation of one additional engine, is that correct?

A. That is correct except I do not like your choice of words when you say, "rearrange the piping". It merely means to extend the piping.

Q. Well, in the preceding year, that is, in 1943, you install two 1300 horsepower Cooper-Bessemer engines, do you not?

A. That is correct.

Q. Now, why wouldn't it be more economical to do all of that work in one year than to go in each successive year and extend the building each time?

A. Well, there is considerable expenditure involved in each of these additions and while it is true that possibly the contractor could execute this work all at one time a little more efficiently than in steps such as I have indicated, nevertheless, the labor involved in installing these units is not the greater part of the costs of making the additions.

The cost of the unit itself and accessory equipment represents the greater part of the cost of making the addition.

We feel that it is economy for the company to proceed in [fol. 6074] the manner that I have indicated, spending its money and making its capital expenditures in the summer of the year preceding the winter for which we need this additional capacity.

Q. You mean to say, then, that if you knew for a certainty in 1943 when you went about increasing the capacity of the Houstonia station, that you were going to have to have four 4300 horsepower Copper-Bessemer engines in order to meet the load which you knew you were going to have to meet in 1945, that you would not install all four of them at one time in 1943 but would proceed to install two in 1943 and then extend the building in 1944 and install one more and then extend the building in 1945 and install the fourth one?

Is that a correct interpretation of your testimony?

A. Yes, sir, but I did not finish a while ago. We have such things as that in mind when we are making these present additions today.

We install a temporary wall in the end of these buildings, that is in the end of the basement, which makes the extension of the building a rather simple matter and the retirements which necessarily follow the destruction of the temporary wall are only nominal amounts.

Q. Do any of your costs in Exhibit 47 include the retirements? A. Yes, sir.

[fol. 6075] Q. Do you have those amounts separately shown?

A. I do not. They are, as I said before, only nominal. I have retirements as shown in my working papers covering the additions to Tuscola, Glenarm and Pleasant Hill compressor stations which have only recently been completed but due weight was given to the retirements which take place in subsequent additions to compressor stations.

Q. What other retirements have you included in your amounts shown in Exhibit 47?

A. The only retirements I have given weight to are the retirements of these temporary walls that we now install in the end of these compressor stations which compressor stations will be extended from year to year.

Q. Now, the situation which I have described with respect to Houstonia compressor station is also true of other compressor stations, is it not?

A. Yes, but it is not quite so apparent on the other compressor stations.

Q. How about Glenarm? You install one 1000 horsepower Cooper-Bessemer engine in 1944 and then you install another 1000 horsepower Cooper-Bessemer engine in 1945, do you not?

A. Yes, that is true, but take, for instance, Pleasant Hill compressor station. We install one 1300 horsepower unit in 1942; two 1300 horsepower units in 1943 and that [fol. 6076] completes the story for Pleasant Hill compressor station.

The same is true of Centralia compressor station, in which we install two 1300 horsepower units in 1942 and three in 1943 and no further additions are made to that station.

It just happens that in the case of Houstonia compressor, the size of the pipe is such and other matters relating to the load that we do not feel warranted in installing this extra unit prior to the time when it would actually be in use.

We thereby save the interest on the money which is involved and possibly the little extra operating expense that might be required in keeping the unit in ship-shape condition.

Q. Now, the next item you have for 1945 is shown in Line 27, Exhibit 47, "Additions to Gasoline and Dehydration Equipment."

Are those additions to be installed at the Liberal station, according to your estimate?

A. They are.

Q. Will you give a description of those additions?

A. Those additions shown in the year 1945, amounting to \$120,000, are practically a duplication of the additions made in the year 1942 as shown on my Exhibit 47.

It consists of two new absorber contactors; one new boiler; the necessary piping, valves and fittings; insulation and so forth, as well as an extension to the boiler [fol. 6077] house building.

To arrive at the \$120,000, I used the same estimate that I used for the year 1942, inasmuch as the increase in the quantity of gas handled through Liberal station indicated that approximately the same increase in gas treating capacity would be required.

Q. And undoubtedly the additions to the gasoline and dehydration equipment in the year 1945 would result in additional revenues derived from the sale of gasoline from the Liberal gasoline plant, is that correct?

A. It would result in additional gross revenue, no doubt.

Q. And it might very well result in additional net revenue, might it not?

A. Depending upon operating expenses.

Q. Now, that completes the capital additions comprehended by your Exhibit 47 through the year 1945. Am I correct in understanding, Mr. Burnham, that at that time, to-wit, at the end of 1945, you will have met the peak day requirements contemplated by Mr. Morton's Exhibit 40 for the year 1946 in the amount of 441,900 M.c.f. except for the readily interruptible industrial load to which you alluded in your testimony late in this morning's session?

A. That is correct.

Q. Going now to the capital additions set forth in Exhibit [fol. 6078] 47 for the year 1946, I note that the first item is shown in Line 30 as "Additions to Main Lines" in the total amount of \$2,388,100. Is that correct?

A. That is correct.

Q. And also I notice that you have some additions to compressor stations in that year in the amount of \$1,229,500, is that correct?

A. That is correct.

Q. What peak are you undertaking to meet now by the installation of these additional facilities?

A. We are undertaking to meet the peak of the winter of '46-'47. The estimate for that winter's peak does not appear—

Q. (Interposing) Does not appear in Exhibit 40, does it? A. That is correct.

Q. Nor does it appear anywhere else in this record, so far as I know, Mr. Burnham. I say that for your information.

A. It is incorporated in my working papers but possibly not on the record.

Q. Well, it is not in your testimony at any rate, is it, that is, any estimate of peak—

Mr. Wheat: (Interposing) Why don't we ask him what it is, if he has got it?

[fol.6079] Mr. Littman: I am not going to ask him what it is unless it is his estimate.

By Mr. Littman:

Q. Is it your estimate?

A. No, it is not.

Q. Of course, you cannot vouch for it, can you?

A. Except I have confidence in Mr. Morton's ability to make these estimates.

Q. I understand that. You have already expressed yourself on that subject.

At any rate, am I correct in understanding that the additions to the main lines in 1946 which are shown in Line 30 of your Exhibit 47 will complete the third loop of the main line east of Liberal station to Dana?

A. I am sorry that, off the record this morning, I indicated to you I would do so but I find now by referring to my working papers that at the conclusion of our construction program in 1946, the third line will be 66 percent completed or the loop constituting the third line will extend over 66 percent of our total distance from Liberal to Dana.

Q. At the end of 1946?

A. That is correct.

Q. Suppose you give us a description of the items comprehended by—

Mr. Culton: (Interposing) Mr. Littman, may I correct [fol. 6080] a statement which you made a while back.

You offered in evidence Exhibit 132 which was Mr. Hinton's estimate of the total amount of production which was required. That is, Mr. Hinton furnished it as having come from Mr. Morton and that carries the totals down through 1946, I believe.

You stated that the estimates were not in the record subsequent to 1946 and evidently, you had forgotten that exhibit.

Mr. Littman: Well, Mr. Culton, there is no dispute about what is in the record. The only fault I find with your statement is, in the first place, I did not offer that in evidence.

I had it identified and you offered it in evidence, but that is of small moment.

In the second place, Mr. Hinton stands in no different position in regard to that purported estimate than does Mr. Burnham because it is not his estimate nor is it Mr. Burnham's estimate. I think the record is clear.

Mr. Culton: At any rate, while Mr. Hinton was on the stand you told him the record now contains Exhibit No. 132 and Exhibit No. 131 and it does.

Mr. Littman: Of course it contains it.

Mr. Culton: If the record contains it, it is in.

Mr. Littman: There are some figures in there that have not been vouched for by the estimator thereof. Now, if you will call that probative testimony, you are, of course, [fol. 6081] entitled to your opinion on that subject. I would not call it probative testimony because the man who estimated it has not testified with respect to it.

By Mr. Littman:

Q. Well, Mr. Burnham, will you please proceed with your description of the additions to the main lines in the year 1946?

A. By the year 1946, the system has become pretty well balanced in the way of power as compared to pipe and

the loops required to carry the extra quantities of gas will be more or less of the same length.

In fact, they extend only the distance from the last gate valve into which the third line loop was tied the year before to the next interconnecting gate valve.

Another reason that relatively short loops are required during the year 1946 is the fact that we have looped a sufficient quantity of the then-existing system to a point where a considerable amount of capacity is gained by further looping, that is, per mile of further looping.

I think it has been placed in the record here the fact or statement to the effect that when a new loop is started, relatively little additional capacity results from the first few miles of new loops but, as one proceeds to complete that [fol. 6082] loop, particularly after it has extended for half of the distance from one compressor station to another, the gain in capacity becomes accelerated to a great extent.

Therefore, I thus stated the loops required between our various compressor stations to carry this extra quantity of gas which amounts to some 27 million cubic feet per day are relatively short.

Beginning at Tuscola station; or rather beginning at the end of the Tuscola loop, we shall be required to build 9.08 miles of 26-inch pipe line at a cost of \$272,400.

Q. Now, all of the 1946 loops, I presume, will be 26-inch pipe?

A. That is correct.

Q. Then we don't need to repeat that again.

A. All right.

Q. Now, we have the 9 miles running east of Tuscola station.

A. That is right.

Q. What is the next one?

A. The Glenarm loop will be extended 8.14 miles at an estimated cost of \$244,200.

Q. What is the mileage on that?

A. 8.14. You understand these mileages bring us to the next gate valve.

Q. Yes.

[fol. 6083] A. That is the reason for the fractions indicated in my figures.

The Pleasant Hill loop will be extended 6.34 miles at an estimated cost of \$190,200.

The Centralia loop will be extended for a distance of 8.18 miles at an estimated cost of \$245,400.

The Houstonia loop will be extended 8.1 miles at an estimated cost of \$233,393.

The Louisburg loop will be extended 8.5 miles at an estimated cost of \$262,064.

The Olpe loop will be extended 8.27 miles at an estimated cost of \$237,440.

The Haten loop will be extended for a distance of 7.88 miles at an estimated cost of \$242,743.

The Greensburg loop will be extended 8.05 miles at an estimated cost of \$236,783.

The Liberal loop will be extended 7.56 miles at an estimated cost of \$223,458.

In totaling the estimated costs of those loops, I have rounded the figure off to the nearest hundred, giving a total of \$2,388,400.

Q. Now, will you describe the additions to compressor stations for the year 1946 in the total amount of \$1,229,500?

A. A new unit will be installed at Tuscola compressor station consisting of one 1300 horsepower Worthington [fol. 6084] gas engine driven compressor.

The building will be extended, the cooling tower will be increased in capacity and certain additions will be made to the piping in the yard.

The total estimated cost is \$182,000 for that work.

At Glenarm compressor station, a new 1000 horsepower Cooper-Bessemer unit will be installed at a cost of \$140,000 which figure includes the cost of extending the main building, making certain additions to the cooling tower and yard piping.